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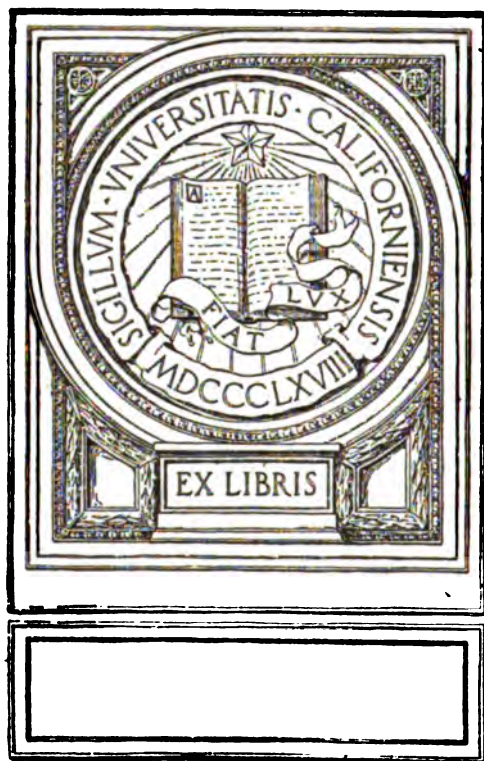
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**ELECTRIC RAILWAY
TRANSPORTATION**

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ELECTRIC RAILWAY TRANSPORTATION

BY

HENRY W. BLAKE

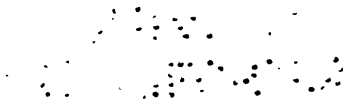
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PREFACE

Many books have been published on electric railway engineering but none until this, we believe, purely on the transportation methods and practice of electric railways. Nevertheless, the men engaged in the transportation department of an electric railway greatly exceed in number those in the engineering department, and the opportunities for financial loss through faulty practice are at least as large if not larger. Most of the accounts of electric railway transportation practice which are mentioned in this book have appeared in the transactions of the American Electric Railway Transportation & Traffic Association or in the columns of the electric railway press. The efforts of the authors of the present volume have been devoted to making this information more readily available in book form and adding such comment of their own as seemed to them of possible help to the operating man.

A word of explanation and caution to the reader in regard to the methods of different companies, as described in the following pages, is necessary. The conditions on the different properties change often, due to legislative enactments, changes in wages paid, altered demands of the public and other causes. For this reason it is probable that when this book reaches the hands of its readers some of the methods described therein as employed by individual companies will have been radically altered or even abandoned. Such a condition is, of course, unavoidable in any developing industry. It ought not of itself to impair the value of the book to the average reader if the latter looks upon its pages not as a record of unchanging practice but as descriptive of some of the methods employed by different companies at the time that the book was written.

A word ought to be said also in regard to the examples cited of practice followed by the different companies. The book is intended in no way to be a compilation of the practice of all companies on the subjects treated. Many companies may be using the same methods as those whose practice is quoted, and in some cases another company may have been the pioneer in the plan followed. The authors have mentioned the examples given in the book in most cases because they happened to be personally acquainted with the methods or because information about them could be more easily obtained.

The references to European tramway practice relate to the period before the war.

As regards the opinions expressed, they give only the ideas of the

authors, and the latter wish especially to exclude any conclusion that they necessarily coincide with those of most electric railway managers. Most of them, however, have been advocated in the columns of the *Electric Railway Journal*, with which both authors have been connected for many years.

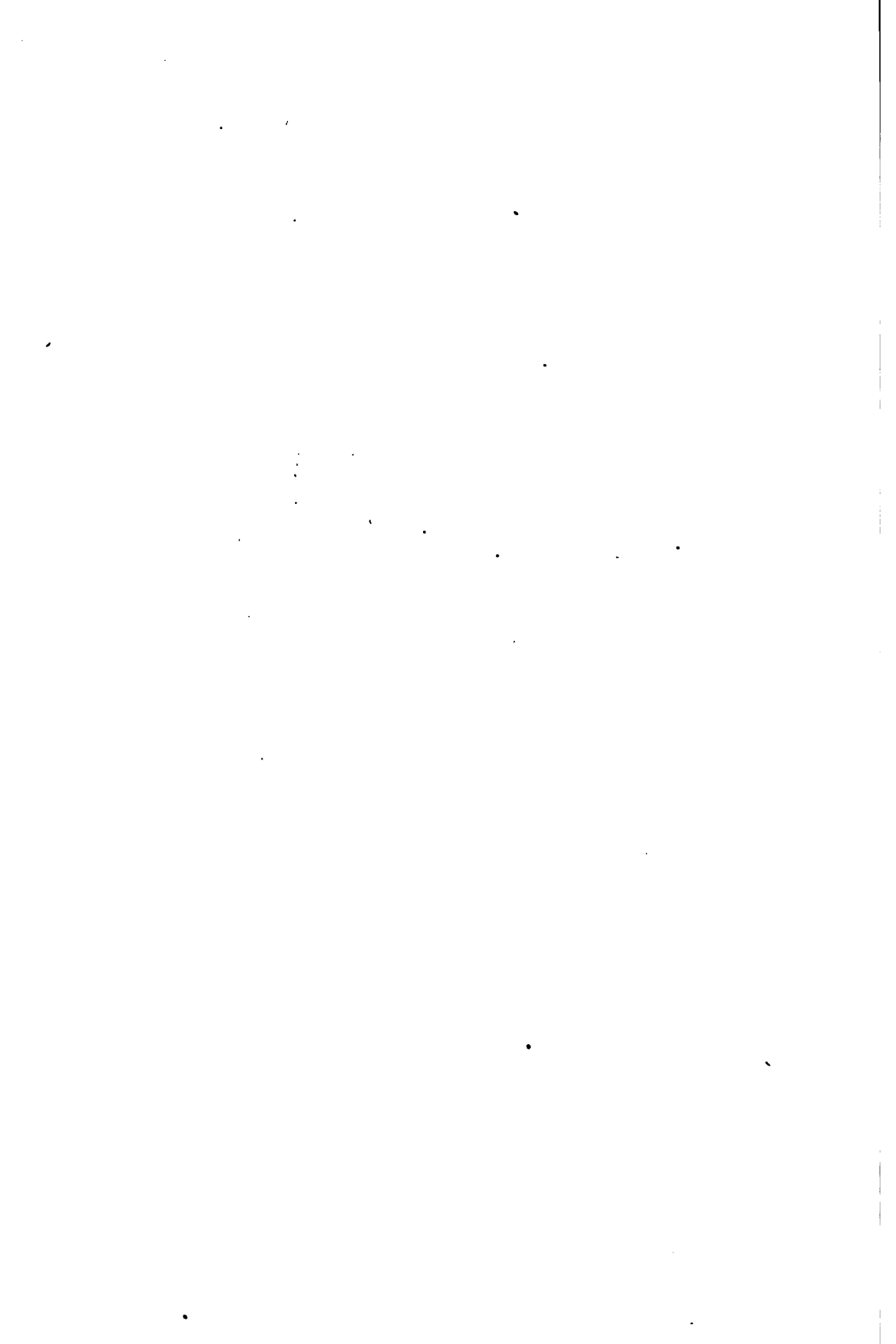
In conclusion, the authors wish to express their appreciation of the kindness of Mr. James D. Mortimer and Mr. Edwin Gruhl, of the Milwaukee Electric Railway & Light Company and the United Railways Company of St. Louis, for reading the proofs of this book and for many helpful suggestions; also to Mr. W. Siebert, of the Brooklyn Rapid Transit Company, and to Mr. Alexander Jackson, of the Public Service Railway, for reviewing the portions relating to schedules and methods of fare collection.

NEW YORK,
April, 1917.

H. W. BLAKE.
W. JACKSON.

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Vol. 1
Chap. 1

ELECTRIC RAILWAY TRANSPORTATION

CHAPTER I

ORGANIZATION AND DEFINITIONS

"For modes of government let fools contest;
Whate'er is best administered is best."

Alexander Pope's dictum applies with equal truth to any other group of men working for a common end. Whether inspectors report to division heads or to the general manager is not quite so important as the fact that they do or do not inspect. The chief points about any organization plan is that it should show clearly the duties of each member of the staff and the various degrees of authority from the humble private to the general manager.

All such organization plans should be shown by means of diagrams. These diagrams, posted in the offices where all interested can see them, will avoid many disputes as to authority.

Organization of Small Properties.—On the smallest properties the transportation or operating department is almost the whole company. Usually the general manager is in direct charge of car service, including signals, plus the duties of purchasing, promotion of passenger and freight business, press relations and claim adjustments.

On lines of less than fifty cars the transportation department consists of motormen and conductors, sometimes reversible in their duties, inspectors, receiver and the dispatcher, starter or trainmaster. The trainmaster not only handles car movement, but prepares the timetables subject to the approval of the general manager. Applications for work are handled directly by the manager, and instruction is given by one or more platform men without the use of a schoolroom except that the master mechanic may be asked to show the men something about car circuits and about the apparatus. On some lines, even with more than 100 cars, inspectors are held unnecessary, possibly because the general manager rides the line frequently himself.

Differentiation Increases with Size.—As the property increases in size the general manager gives up direct charge of transportation, the department being placed under a superintendent of transportation. Such matters as traffic solicitation and the handling of complaints may

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also be placed in the hands of specialists who report directly to the general manager.

It would be a tedious matter to describe all possible forms of organization, for these must differ not only because of the number of cars but also because of the mileage and character of operation. Therefore, it will serve to describe at length only a few of the largest organizations to show how far specialization of duties may be carried.

As an introduction to the larger organizations, some general diagrams may be briefly discussed. Most of these diagrams are taken from the report of the American Electric Railway Transportation & Traffic Association for the year 1912.

Fig. 1 for companies with 100 to 250 cars shows that the car maintenance department is still subject to the superintendent, while the transportation department has already specialized into dispatching (including timetable) and instructing branches.

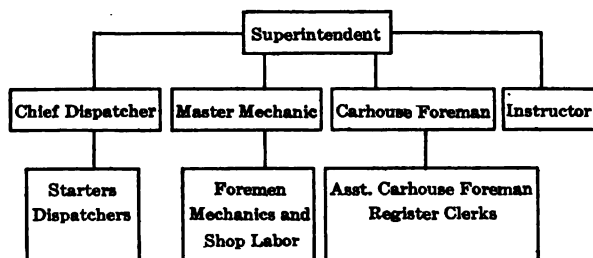


FIG. 1.—Organization of railway with 100 to 250 cars.

There are still several companies much larger than the class shown in Fig. 1 which allow car inspection to be handled by the transportation department while heavier repairs are handled by the mechanical department. The mechanical department should be solely responsible for all car maintenance, whether inspection or overhauling, because the tendency of the transportation department is to keep the car out on the line longer than is good for it. New types, known to be popular with the public and with the men, should not be allowed to run to the point where they will need nine stitches instead of one. On the other hand, the mechanical department has no favorites to play. Since it is interested in keeping all cars in good order, the mechanical department should be allowed to lay down and enforce a definite inspection mileage for each type of car in service.

Fig. 2 for companies with 250 to 500 cars shows a still greater subdivision into "records, complaints, rules and regulations," "bulletins," "employment," "instruction," "transfers," "lost articles," etc. In this diagram the mechanical department is not shown because on a system of this size the head of the mechanical department does not report to the

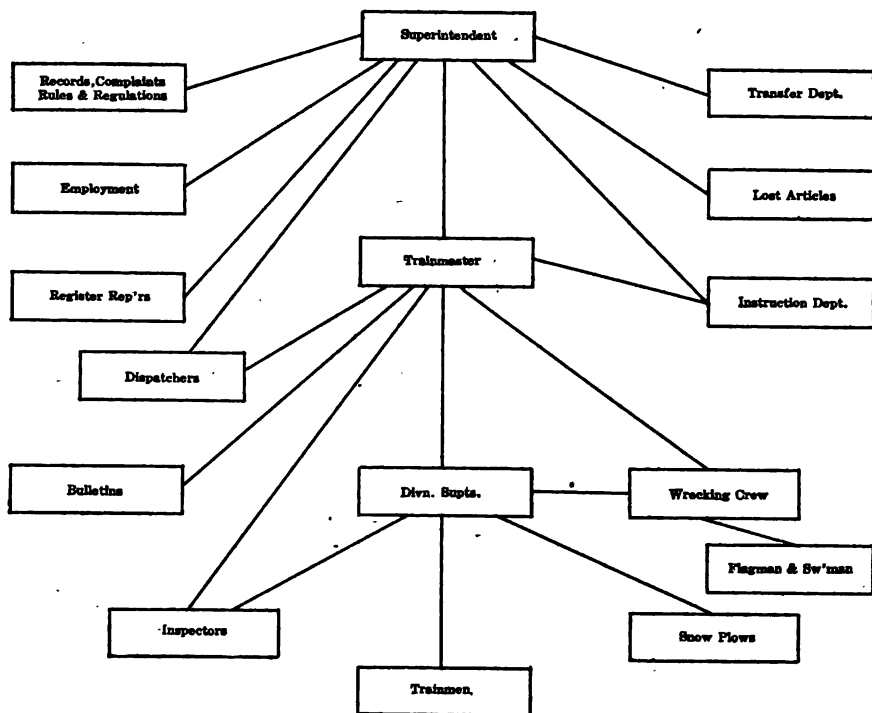


FIG. 2.—Organization of transportation department on railway with 250 to 500 cars.

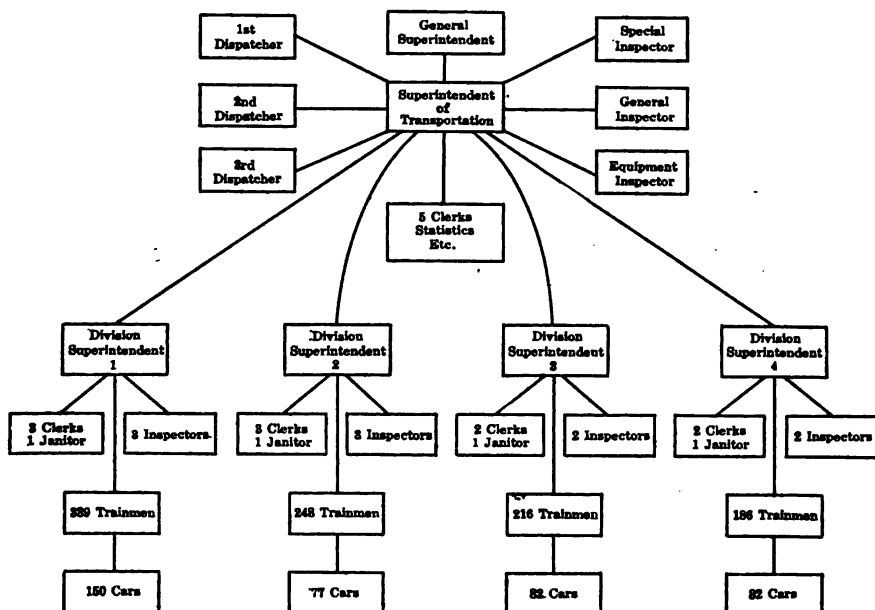


FIG. 3.—Organization of transportation department on railway with 500 to 1,000 cars.

superintendent but to the general manager. An improvement, which might be suggested, would be to have the register repairs performed by either the mechanical department or the treasurer's department for mechanical and confidential reasons respectively.

Fig. 3 for 500 to 1000 cars is significant because of the divisional organization and the addition of a statistical branch. Inspection also is under three heads: "special inspector" may be assumed to refer to secret

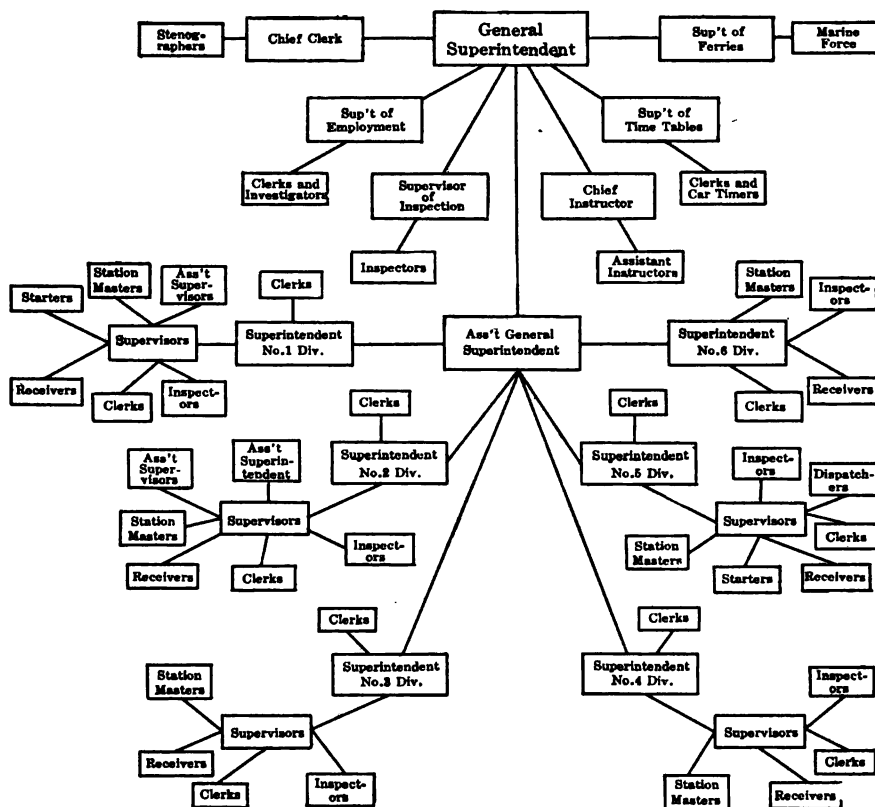


FIG. 4.—Organization of transportation department on railway with 1,000 cars or more.

service, "general inspector" to the usual uniformed force, while "equipment inspector" indicates that the mechanical department gets many first-hand tips from the transportation department.

Fig. 4 for 1000 cars or more covers a combined city, suburban and interurban system, the Public Service Railway. It is so well articulated and logical that it calls for little comment. This company has no formal complaint department, complaints being referred to the executives direct upon receipt from individuals or the publicity department. Traffic pro-

motion also is handled through this publicity department. It will be noted that the receivers are a part of the transportation personnel although other companies have them report directly to the auditor or treasurer.

Fig. 5 shows the organization of an interurban railway, the most noteworthy difference being the addition of station men or agents. The small numbers of cars for the great amount of mileage on interurban railways means less specialization despite more divisions. In fact, it is not unusual for substation men to work also as ticket and freight agents.

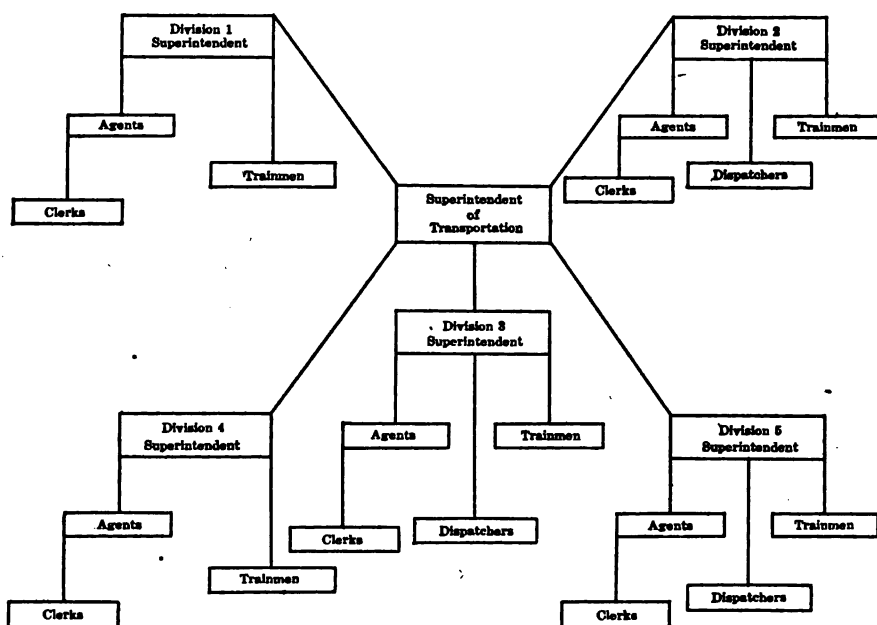


FIG. 5.—Organization of transportation department on an interurban railway.

Fig. 6 for the Manhattan Elevated Division of the Interborough Rapid Transit Company, New York, combines many functions of both street and interurban lines because of the dense, though high-speed travel. This organization plan is described in detail hereinafter. On the Boston Elevated Railway's rapid transit lines, unlike New York, Brooklyn and Chicago, coin inspectors replace ticket choppers as motor-driven coin registers are used instead of ticket boxes.

Fig. 7 shows the organization of the Chicago Elevated Lines. Under the general superintendent are five division superintendents in direct control of train operation in their respective parts of the city. The assistants of the division superintendents are the day and night trainmasters and the service inspectors to the number shown on the diagram. Dis-

patchers who are in immediate charge of the motormen and trainmen are stationed at each of the terminals.

Organizations for Freight Handling.—The handling of freight and express may call for a department with a general freight agent and clerical staff down to station and warehouse men. On a large interurban system like that of the Detroit United Railway the express and freight traffic department includes a general express and freight agent, a traveling freight agent, a chief clerk, an "over, short and damage" clerk and a

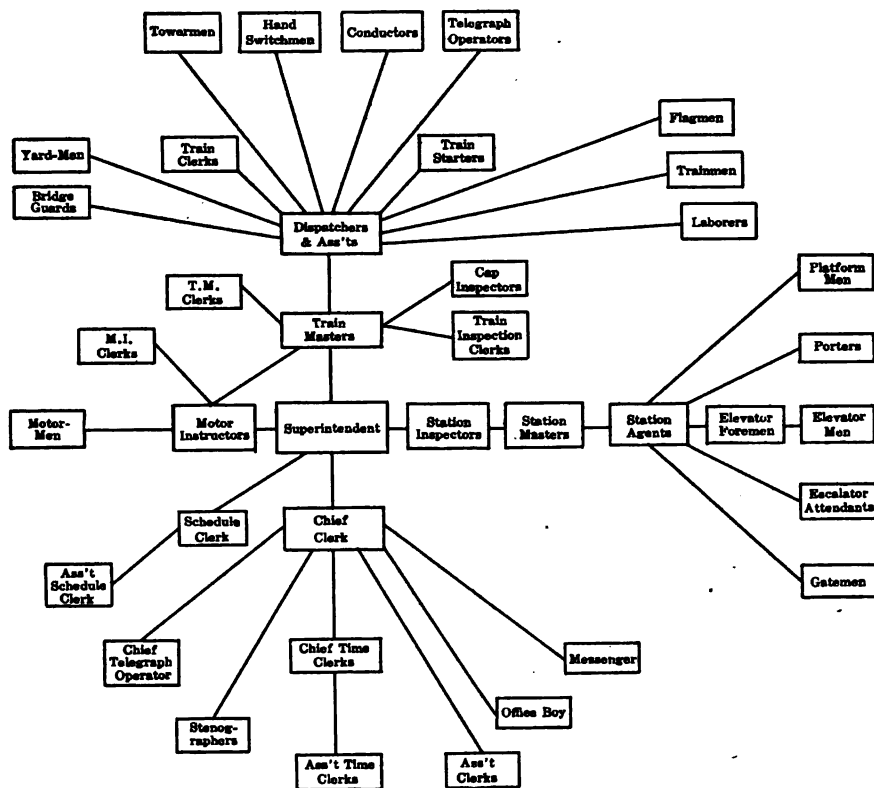


FIG. 6.—Organization of transportation department on the Manhattan Elevated Division, Interborough Rapid Transit Company.

claim clerk. In addition to these men, all the way-station agents report to the general agent on express and freight matters.

The Detroit Company, unlike others, has no freight solicitors except for business carrying a high transportation rate and low warehouse cost.

The traveling freight and express agent acts as an assistant to the general agent in issuing transfers and arranging schedules. He also personally solicits desirable freight and express shipments in advance of their movements to points on his lines. The claim clerk undertakes to

clean up all freight, unclaimed or refused, as fast as it accumulates. The clerk in charge of "over, short, damaged or refused" reports conducts all correspondence necessary to obtain disposition or trace shipments. If a personal investigation is necessary, it is made by the local agent or the traveling express and freight agent.

Fig. 8 shows the organization of the transportation department of the Buffalo, Lockport & Rochester Railway. The superintendent of transportation here is really superintendent of transportation and traffic as he handles the duties of both departments and is the filing officer

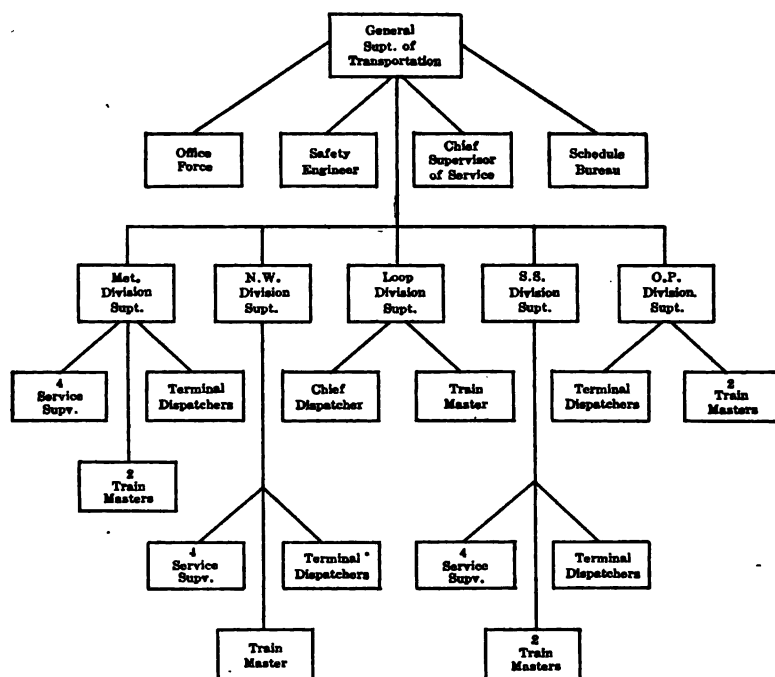


FIG. 7.—Organization of transportation department on the Chicago Elevated Lines.

with the tariff department of the commissions. All of the company's tariffs are issued by him as superintendent of transportation, with the approval of the general manager.

For train dispatching a two-circuit telephone system is used, so arranged that train crews are enabled to call in from each station and siding. The train crews and freight and express messengers come directly under the authority of the dispatcher. The express messengers are also responsible to the express company, which operates over the railway.

Stations agents are responsible at most stations for passenger, freight and express business, reporting as to the two former classifications to the

superintendent of transportation, and as to the latter, to the express company. With respect to the reports and accounting, station agents are under the instructions of the auditor.

This company handles both carload and less than carload freight, the messenger acting as trainman in the handling of trailer cars, where a crew of three men is required.

Recent Tendencies in Organization.—Recent developments in transportation organizations are: first, traffic survey departments for periodical traffic counts; second, efficiency departments which are built up primarily to compare the platform men's efficiency and to secure service data from the figures shown by registers, meters and coasting and traffic recorders on cars; third, welfare work, if confined to the car men.

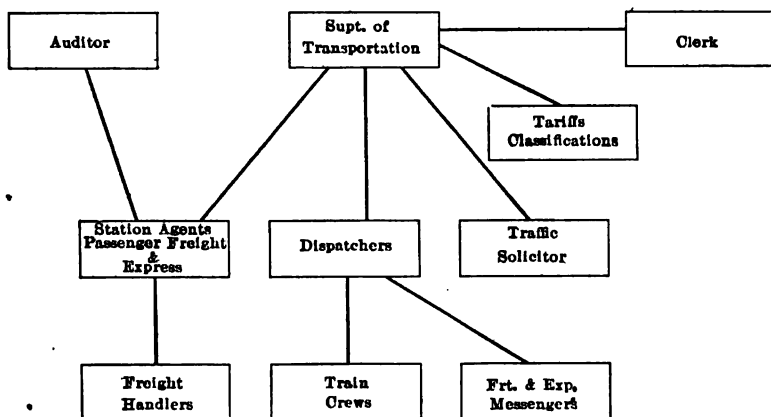


FIG. 8.—Organization of transportation department of an interurban railway with freight and express service.

Duties of Transportation Men in General.—The duties of platform men and their officers are defined to some extent in the standard city and interurban codes of rules of the American Electric Railway Transportation & Traffic Association. They have, therefore, been omitted here except in the analysis of the Brooklyn Rapid Transit and Manhattan elevated organizations hereinafter detailed.

The Brooklyn Organization.—The following is an analysis of the Brooklyn Rapid Transit surface lines organization for operating 593 miles (measured as single track).

The superintendent of surface transportation has the following staff of major officers:

- Supt. of timetable department.
- Division superintendents.
- Superintendent of employment.

Supervisor line inspection branch.
Supervisor instruction branch.
General inspector.
Inspector of motor service.

Timetable Department.—Under the chief of this department are non-uniformed inspectors, who make the traffic counts; timetable makers; clerks and stenographers. This company does not attempt to have its trainmen keep count of the goings and leavings of passengers at specific points. In the first place the men would not have the time to do this properly; in the second place it would be to their interest to show figures that would result in more carhours.

Divisional Organization.—Each Brooklyn division superintendent has a staff as follows: Depot masters who act as aids to the superintendent and have supervision of carhouses, men, etc; dispatchers; starters who see that the schedule interval is kept; line inspectors who inspect all classes of platform service except fare collection and registration; register inspectors, transfer clerks who check the distribution, punching and collection of transfers; stenographers; depot clerks; depot force like watchmen, porters, car cleaners; trainmen; mileage computers. These mileage computers not only compute mileage for the transportation, comptroller and Public Service Commission records, but they also advise the mechanical department as soon as each car approaches the 1000-mile inspection standards.

On the Public Service Railway, Newark, a system of 833 miles, the superintendent's immediate aides are termed supervisors and these in turn direct the work of the station (depot) masters, inspectors and other members of the supervisory force. All men in charge of dispatching cars are called "starters."

Employment Bureau.—This is headed in Brooklyn by the superintendent of employment (who also handles men for the elevated division). Under him is a supervisor of the record branch, covering employees personal records; a supervisor of the appointment branch, including re-appointments and transfers; physician, who examines applicants and re-examines certain classes of employees at regular intervals; investigators who look up previous employers claimed by applicants, operators who record and cover distribution of telephone reports, clerks; stenographers.

Line Inspection Branch.—The supervisor of this branch has jurisdiction over uniform methods for the inspection of conductors and motormen, both students and regulars, and passes upon the qualifications of ex-motormen for re-appointment.

Chief Inspector of Motormen.—This official has supervision over the inspectors of instruction who between the eightieth and ninetieth hour

of instruction period ride with each student motorman to judge his qualifications.

Chief Inspector of Conductors.—The duty of this official covers work of conductors in the same manner as is done by the chief inspector of motormen.

Inspectors of Instruction.—These officials inspect the work and progress of students, as well as the performance and qualifications of the instructing motormen or conductors who have the students in charge and inspect the work of older employees.

Supervisor Instruction Branch.—This official has supervision over the school of instruction as well as the line and platform instruction of student conductors and motormen. He examines conductors and motormen proposed for promotion to higher grades of service, and also works with the company's "Safety First" bureau.

Chief Instructor (Schoolroom).—This official is in immediate charge of the school of instruction where all newly appointed conductors and motormen are required to pass before assignment to the line for further instructions.

Instructing Motormen (Schoolroom).—These men are assigned to the schoolroom as assistants to the Chief Instructor.

Boss Motormen (Line).—These men are assigned to depots to pass upon the final qualifications of student motormen after completion of line instructions, after which the student is directed to report to the chief instructor for final examination.

Boss Conductors (Line).—These men are assigned to depots to pass upon final qualifications of student conductors after completion of the line instructions, after which the student is directed to report to the chief instructor for final examination.

Platform Instructing Motormen and Conductors (Line).—These men are appointed from the active list of competent motorman and conductors to instruct students. These instructors are checked monthly by the supervisor of the instruction branch to keep them tuned up to the latest developments.

Special Inspectors.—These are non-uniformed men who make special inspection of depots and lines and perform such other confidential duties as may be assigned to them by the superintendent of surface line.

New York Elevated Lines.—The duties of the persons named on Fig. 6 are briefly as follows:

Superintendent.—The superintendent reports to and receives instructions from the general manager, to whom all appointments, promotions, transfers and dismissals are referred for approval. All orders and notices issued by him bear the approval of the general manager. He is authorized to suspend any employee in his department, and to enforce proper

penalty for the violation of rules, reporting his action to the general manager. He makes no change in the running of trains without the authority of the general manager.

Trainmasters.—Trainmasters report to the superintendent. Assistant trainmasters are subject to the orders of both superintendent and trainmaster. These officials take charge of the division, or such portion of it as may be assigned them in the name of the superintendent. They exercise a general supervision over and are directly responsible for all employees connected with train service. They may suspend them for neglect of duty or violation of rules, subject to the approval of the superintendent. They must observe that transportation employees are furnished with all the necessary signals and use them in accordance with the rules.

Train Dispatchers.—Train dispatchers report to and receive instructions from the superintendent, trainmasters, and assistant trainmasters. They have charge of the yard and sidings at stations where trains are made up, the movement of trains therein, and of the yard force employed at those points. They are responsible for the dispatch of trains within the limits of the yard and the proper position of the switches. They must obey the superintendent and trainmaster in regard to the distribution of cars and the make-up of trains. They must give the necessary directions for drilling and placing cars in proper positions in the trains, and see that they leave on time.

They must see that motormen and trainmen are ready and in condition for duty at the prescribed time, and have all the timetables, signals, lamps, and other fixtures required by the rules; that the yard is kept in good order; that cars passing are properly inspected, and those requiring repairs sent to the shop; that train clerks keep a record of the number of each car arriving at and departing from their stations, and that daily reports of the same are made in accordance with instructions.

They must report to the superintendent or trainmaster all violations of rules coming under their notice, and cars arriving in bad order. When accidents occur, requiring the services of trackmen, they will instruct operators and station agents to notify them along the lines, over the signature of the roadmaster.

Motor Instructors.—The motor instructors report to and receive instructions from the superintendent and trainmasters. They ride frequently over the road with motormen, and instruct motormen in the proper handling of their controller and air brakes. They report to the superintendent violations of rules or neglect of duty. They consult with the train dispatchers and trainmasters as to the qualifications of motormen, and report same to the superintendent. They instruct and examine

all men ready for promotion to motormen, and report results of such examinations to the superintendent.

Motormen.—Motormen report to and receive their instructions from the superintendent, trainmasters and motor instructors. When shifting cars, making up trains, starting from terminals, and while on the road, they are also subject to the orders of the train dispatchers. They must have in their possession a copy of the rules and regulations, instruction book, the timetable, and a full set of signals ready for use. Each man must also be provided with a reliable watch and regulate it by the clock in the train dispatcher's office, and must compare time at least twice a day with the conductor.

On many high-speed interurbans it is obligatory for the men to have watches of a specified standard of accuracy and to have these watches regulated at definite intervals by certain jewelers.

They must obey promptly all signals given by station agents, telegraph operators, track repair men, conductors or guards. When in doubt as to the meaning of a signal, they must stop and ascertain the cause, and if a wrong signal is shown, they must report the fact to a superior officer. They must not leave their car except in case of absolute necessity, and must always leave the conductor or some other competent person in charge. They must report promptly to the train dispatcher any car defect and on arrival at terminal, make a written report.

They are under the orders of the conductors in regard to starting, stopping and general management of the train between terminal stations, but they will not obey any order that may endanger the safety of the train or require violation of the rules.

Towermen.—Towermen report to and receive instructions from the superintendent, trainmasters and dispatchers. They are under the immediate supervision of the division trainmaster. They must carefully examine the conditions of the switches in their charge, keep them clear of obstructions and promptly report any defects to the dispatcher in charge. Towermen must be particular to note and report to the dispatcher any case of motormen running over switches or junctions at too great a rate of speed. Should a motor or train pass a danger signal or explode a torpedo, they must report as soon as possible, giving motor number, name of motorman and conductor, if possible, time, train, etc.

They will report to the local superintendent, trainmaster, or other official in charge, all unusual occurrences or violation of the rules governing the passing of trains and cars over switches and by signals.

In cases where interlocking machinery fails to work properly, the towerman must co-operate with the outside man in trying to remedy the trouble. Men in charge of, or working interlocking switches, receive instructions from the dispatchers and trainmaster, relative to all matters

pertaining to working their levers in the movement of trains; in regard to the care and maintenance of the interlocking apparatus, they obey the orders of the roadmaster.

Hand Switchmen.—Hand switchmen report to and receive their instructions from the superintendent, trainmaster and train dispatchers. They are under the immediate supervision of the division trainmasters, and obey all orders and signals in relation to the moving of switches and signals, and the movements of cars given by the dispatcher, or by his instruction.

Conductors and Guards.—Conductors and guards report to and receive their instructions from the superintendent, trainmaster and train dispatchers. Conductors are responsible for the safety, regularity and proper care of their trains; for the conduct of their guards; must know that they are instructed in and observe the rules for the ventilation, heating and lighting of cars, and for their signals, lamps, tools, etc.

Full reports, in writing, of all accidents, detentions and unusual occurrences, or of difficulty with passengers, must be made and sent to the superintendent, and the names of as many witnesses as possible, including employees, must be secured and embodied in the report. Conductors are not relieved from duty until their daily reports are handed to the train clerk.

The post of the rear guard is on the last car in the train, and he must never leave that car while the train is in motion, except when required to go back to protect his train. He must be provided with and display the signals at the rear end of the train.

Trains are under the charge of conductors thereof, except when the instructions given by them are in violation of the rules or of safety, in which cases both conductors and motormen are held responsible. Whenever a car is run over any portion of the road without a conductor, the motorman thereof is regarded as conductor and acts accordingly.

Inspectors.—The inspectors have charge of all station masters, agents, gatemen, platform men and porters; they may suspend any station man for dereliction of duty, intoxication, absence without permission, or other cause which they may deem sufficient, and send him to the superintendent with a written statement of the reasons for suspension. They make a written statement to the superintendent whenever repairs to stations or fittings are required; and watch to prevent waste.

Station Men.—Station men comprise station masters, agents, platform men, gatemen and porters. They report to and receive their instructions from the superintendent and station inspectors, but are under the immediate direction of the station inspector.

Station men must give passengers all the information they can as to routes, change of cars and time of trains. Station men sworn in as special patrolmen, in addition to being governed by the rules of the company, are

subject to the regulations issued by the City of New York governing special patrolmen.

Station Masters.—Station masters report to and receive their instructions from the station inspector. They are held responsible for the manner in which all station men at their respective stations perform their duties.

Station Agents.—Station agents receive instructions pertaining to cash, from the cashier, and instructions pertaining to their tickets and ticket accounts from the auditor. They are responsible for the cleanly condition of ticket offices, station rooms, platforms and stairways, must see that the porter attends to same, etc.

Gatemen.—Gatemen are in charge of the ticket cancelling box.

(Station) Platform Men.—Platform men must always be at their posts ready to furnish necessary information, and to announce the destination of approaching trains. They must stand at the car gates when trains stop and see that no passengers enter until those so desiring have left.

Wire Operators.—Telegraph (or telephone) operators report to and receive instructions from the superintendent.

City Transportation Definitions.—In conclusion of the subject of organization, the following definitions of terms used largely in city transportation are presented. They are from the 1916 report of the committee on definitions of the American Electric Railway Transportation & Traffic Association.

Accident Report.—Form used for trainmen's report of accident or other unusual occurrence affecting passengers or other persons.

Allowed Time.—Time on which wages of trainmen are based, composed of platform time, terminal time, fall-back time and additional period for reporting, etc.

Assembly Room.—A portion of car house assigned for use of trainmen.

Assignment Sheet.—An index of the names of car crews and the runs which they have selected or to which they have been assigned.

Bulletin Board.—A fixed location for the display of orders and notices.

Car, Extra.—See "Extra Car."

Car, Regular.—See "Regular Car."

Crossover.—A connection between parallel tracks by which cars may be switched from one track to the other.

Day Card.—See "Trip Sheet."

Defect Report.—Form used by trainmen for report when cars or equipment need repairs.

Designation Sign.—A numeral or letter shown on car to indicate route and terminal of a line.

Directlory.—See "Assignment Sheet."

Extra.—A trip or group of trips put out to supplement existing service as required but not shown on any timetable.

Extra Car.—A car used as a tripper during rush hours, or when some emergency need exists for service, and usually operated by extra trainmen.

Extra Run.—A trip or group of trips designated by a number on the timetable which is not a regular run.

Extra Trainman.—A trainman who is not a regular trainman.

Extra Working List.—A list posted daily showing the working and reporting time of extra men.

Follower.—The following car on the same line.

General and Special Orders.—Notices relating to matters of operation, discipline, etc., issued by officials of the Transportation Department for the information of trainmen.

Headway.—The interval between any two cars or trains running on same track in same direction.

Leader.—The preceding car on the same line.

Line.—A succession of cars or trains on one route or various routes, a portion of which is used in common.

Miss.—A failure of a trainman to report on time.

Orders.—Special notices issued for information or government of employees.

Patch.—A substitute for a portion of a timetable in effect, applied in such a way as to cover parts of the table for the purpose of increasing or decreasing the service.

Passenger Stop.—A point designated by street intersection or sign, as a regular place where the car stops on signal for passengers to board or alight.

Platform Time.—Actual time spent by trainmen on car during performance of duty.

Regular Car.—A car used by trainmen having a regular run.

Regular Run.—A trip or group of trips designated by a number on the timetable, arranged for selection by, or assignment to, a crew as a day's work.

Regular Trainman.—A trainman who selects or is assigned to a regular run until next selection or assignment of regular runs.

Relief.—A trainman who relieves another from duty.

Relief Point.—A designated point on a route where a trainman relieves another from duty.

Report, Accident.—See "Accident Report."

Reporting Time.—Time at which trainmen are required to report for duty as shown on timetable or working list.

Round Trip.—The operation of a car or train over a route from one of its terminals to the other and return over the same route.

Route.—A defined course for the operation of a car or train.

Route Sign.—Sign on car indicating route to be followed by car.

Run.—A trip or group of trips designated by a number on the timetable.

Run Guide.—An index of the on and off time and the total working time of each run.

Run Number.—A distinguishing number given to each set of car trips constituting a run.

Running Time.—The time allowed on the timetable for the operation of a car between given points.

Safety Stop.—A stop prescribed by rules or ordinance, as before crossing a railroad, drawbridge, etc.

Seniority List.—A graded list of trainmen based on length of service, indicating the order in which they may select or be assigned runs.

Show-up Time.—Time fixed for trainmen to report at car house.

Station Master.—An official or employee of the Transportation Department in charge of a carhouse and of the trainmen and other transportation employees reporting there.

Straight Run.—A straight run consists of a day's work of an established number of continuous hours, broken only by an interval for a meal.

Swing Run.—A run constituting a day's work in which the time composing it is divided into two or more periods—usually covering morning and evening rush hours.

Terminal.—An end of a route.

Terminal Time.—Time allowed between end of one trip and start of next.

Time Point.—A point where train should arrive, pass or leave, as stated on timetable.

Train Number.—The number arbitrarily assigned to designate a train.

Trip.—The operation of a car or train over a route from one of its terminals to the other.

Tripper.—A car which makes one or a limited number of trips during the rush period to meet emergency demands.

Trip Sheet.—A record of fares and transfers collected and transfers issued, also showing leaving time, for each half-trip of a day's run. It is turned in with collections at the end of the day's work. (Also known as Day Card.)

Turn-back.—A practice, due to pre-arrangement or emergency, by which a car is not operated to its regular terminal.

Interurban Traffic Definitions.—The following additional definitions appear in the interurban code for 1914:

Motor or Engine.—A car or locomotive propelled by any form of energy.

Train.—A motor or engineer, or more than one motor or engine coupled, with or without cars, displaying markers.

Regular Train.—A train authorized by the timetable. It may consist of sections.

Section.—One of two or more trains running on the same schedule displaying signals, or for which signals are displayed.

Extra Train.—A train not authorized by the timetable. It may be designed as:

Extra.—For any extra train except work extra.

Work Extra.—For work train extra.

Superior Train.—A train having precedence over other trains. A train may be made superior to another train by right or class.

RIGHT is conferred by train order; class by timetable.

RIGHT is superior to class.

Train of Superior Right.—A train given precedence by train order.

Train of Superior Class.—A train given precedence by timetable.

Timetable.—The authority for the movement of regular trains subject to the rules. It contains the classified schedules of trains with especial instructions relating thereto.

Schedule.—That part of a timetable which prescribes the class, direction, number and movement of a regular train.

Main Track.—A principal track upon which trains are operated by timetable, train orders, or block signals.

Single Track.—A main track upon which trains are operated in both directions.

Double Track.—Two main tracks, upon one of which the current of traffic is in a specified direction and upon the other in the opposite direction.

*Current of Traffic.*¹—The direction in which trains will move on a main track under the rules.

Station.—A place designated on the timetable by name or number at which a train may stop for traffic.

Initial Station.—The station on each division at which a train is first timed.

Siding.—A track connecting with a main track, where trains meet or pass.

Meeting Point.—A place where opposing trains, i.e., trains moving in opposite direction, meet by schedule or train order.

¹ NOTE.—The term "Current of Traffic" does not apply to single track.

Passing Point.—A place where trains moving in the same direction pass by schedule or train order.

Fixed Signal.—A signal of fixed location, indicating a condition affecting the movement of a train.

"Fixed Signals" cover such signals as whistle boards, slow boards, stop boards, yard limits, switches, blocks, semaphores, or other means for indicating "whistle," "stop," "caution" or "proceed."

Yard.—A system of tracks within defined limits provided for the making up of trains, storing cars, and other purposes, over which movements not authorized by timetable or by train order may be made, subject to prescribed signals and regulations.

Yard Motor or Engine.—A motor or engine assigned to yard service and working within yard limits.

Pilot.—A person assigned to a train, who is responsible for its safe operation, when the motorman or conductor, or both, are not fully acquainted with the physical characteristics or running rules of a road or portion of a road over which the train is to be moved.

Markers.—Signals carried on rear end of train indicating that it is a train and that it is the end of the train.

Classification Signals.—Signals carried on the front end of the train to indicate that it is a section of a train or an extra.

Range of Vision.—The distance ahead along the track to the farthest object that can be plainly distinguished. It is affected by obstructions, by darkness, by weather conditions, etc.

CHAPTER II

ADJUSTMENT OF SERVICE TO TRAFFIC

The problem of the operating organization described in the previous chapter is to carry the passengers presenting themselves for transportation safely, comfortably and expeditiously to their respective destinations at a minimum of expense to the railway company. If this service could be performed in equal hourly amounts throughout the day, the task of the railway company would be a simple one. It would have merely to plan its work as a manufacturer arranges for the output of his factory, that is to say, it would have to provide no more cars and crews than could be kept continuously employed throughout the day. Unfortunately for the railway, this is not the way in which the demand for transportation comes. Traffic fluctuates throughout the day, week and year, and is affected by industrial conditions, the weather and a thousand other factors.

While it is obviously necessary to proportion the service to the traffic to a very large extent, it is impracticable for a railway company to do so absolutely. The cost of providing the necessary cars and crews for the very short time that they would be required during the peak of the morning and evening rush would be prohibitive, even if the tracks had the capacity for the additional cars required. On the other hand, it is not uncommon for many operators to provide during the non-rush hours more cars than those actually required to carry the passengers. Such a plan is desirable because not only will light-hour travel be encouraged thereby, but patrons will be more ready to believe that rush-hour standing is unavoidable if there are plenty of seats at other times. Furthermore, a liberal all-day service will call for fewer trippers and will allow a larger proportion of full-time men, and as many companies now guarantee their extras a minimum wage, it is good policy to use these men at least to the limit of their wage. If a man is paid for 6 hr. it is pretty poor policy to use him only 3 hr. or 4 hr. when the labor cost is so large a part of the total operating expense.

The obvious importance of the use of scientific methods in the preparation of schedules so as to adjust railway service to the traffic has been increased by the growing tendency of state and municipal regulatory bodies to require certain standards of service and car loading. The former crude methods of preparing schedules by tradition or rule-of-

thumb have therefore practically passed away and have been supplanted by periodical analyses conducted by the railway company of traffic mass and movement.

Foreign Car Standards.—It is commonly supposed that standing in cars is a strictly American product. This is not true. In Europe, standing room is specifically permitted on both the front and rear platforms and women will be seen there as often as men. Police regulations require that the permissible number be stenciled on the bulkhead at each platform. The number varies from four to eight on motor cars, but trailer car platforms as at Zurich sometimes have a standing capacity greater than the inside seating capacity. The prohibition against standing inside may be relaxed at the discretion of the conductor, especially in cold or wet weather. The conductor also decides whether passengers shall move closer to make room for others should the number per longitudinal seat already equal that shown by a placard or sign above. A regulation of this kind has been tried occasionally on American lines with similar seating but it has never become general practice.

In Leeds, Belfast and Moscow the limit on platforms is eight passengers. In Berlin the usual number is seven. But under certain conditions a larger number is permitted such as during sudden showers, snowstorms and Sundays and holidays after 3 p.m., etc. Where the number is limited in this way passengers form a line, called in England a queue, and await their turn to be admitted on the cars. A ticket system with serial numbers is used in Paris for the patrons of the buses.

No special restrictions against standing appear to be in force on the subway and elevated lines abroad.

Traffic Counts.—While the traffic bureau is still a fledgeling it has already proved that more service can be given at less expense when the railway has exact knowledge as to the origin and distribution of traffic and the causes of congestion. Not only is the railway enabled to use its cars to better advantage, but it is also able to point out to the municipality and the public the benefits that would follow for all from certain re-routings, additional trackage and vehicular traffic regulation.

Use of Platform Men or Inspectors.—The simplest—and often misleading—form of traffic analysis is that based on the conductor's day or trip card. Such a card gives only the riding between terminals without the least indication of the loads at different points along the route so that its principal value is to show when another real traffic count is necessary. Traffic records based upon the conductor's figures covering selected stops may be equally misleading. The conductor usually is too busy to keep such a record with the needed accuracy, and while his trip report might be of some value in showing the relative amount of business from day to day and week to week, it is not a good guide on which to base hori-

zontal cuts or additions in service. One case of heavy loading might be due to excessive crowding throughout, another only for a short peak of less than a mile, a third because of transfers, or other causes.

The line inspector is another individual who should be used only with caution. While he has no axe to grind he is kept busy enough in seeing that the cars keep to the schedule, that traffic rules are being obeyed, that passengers are being helped where necessary, etc. An inspector may see two or three heavily loaded cars and then, his mind being taken up with other matters, fail to see the underloaded cars which may be following immediately behind.

Traffic Bureaus.—All traffic notations are best made by a staff of clerks who are capable of reading car loads quickly and putting down legible figures. Such a staff is logically a part of the timetable department. The number of men required naturally varies with the mileage, population, frequency of investigations and amount of detail desired. However, figures concerning the following properties will be a guide inasmuch as their timetable departments make comprehensive records of on and off traffic, relation of passenger load to seating and standing capacity throughout an entire line, comparative use of long- and short-line cars, etc.

The Public Service Railway, Newark, N. J., operating 833 miles of single track has as many as thirty men made up as follows: one superintendent; one assistant superintendent; four timetable clerks; one traffic engineer; two traffic investigators; four investigators who follow up complaints about excessive speed, overcrowding, etc.; fifteen to twenty car timers or checkers who are stationed at heavy traffic points or compulsory stops. Observations of some lines are made every two weeks, and on the heaviest lines once a week.

The Pittsburgh Railways operating 603 miles of single track has eight men who work in the office up to 4.30 p.m. and then go out for 2 hr. to check traffic. These men report to a traffic agent. Every line in the system is placed under observation at least every six months.

The Boston Elevated Railway operating 472 miles divides its territory into seventy-six traffic districts, the observations being made at points of heaviest loading and at junctions. Each man works the same territory exclusively and thus becomes very skilful. Each traffic point is checked every fifteen days, or five points a day. The number of passengers is totaled and averaged every 30 min., and from these figures changes in service are made directly without using traffic curves. It is found that one man can make an accurate record of car number, arriving time and passengers with cars on a headway of 30 to 45 sec.

One of the larger city systems of the Central West, with more than 250 track miles, uses its office men for traffic studies as they travel to and

from work on the company's cars. Cards are provided on which to show route, car number, direction, points where the reporter entered and left car, number of passengers and general remarks. This practice doubtless is economical and of some use to the company, but it can hardly be considered as best meeting the needs of a traffic bureau or timetable department.

Traffic Density Diagrams.—Previous to 1905 few companies here or abroad had made any traffic diagrams except those compiled from car receipts. Thus the Philadelphia Rapid Transit Company constructed maps which showed the relative proportions of traffic on different streets. On these maps if route *A* carried twice as many passengers as route *B* it was shown by a line of twice the thickness. A recent example is the diagram of rush-hour car traffic for January, 1915, as reproduced from the sixth annual report of the Board of Supervising Engineers, Chicago Traction, and shown in Fig. 9.

An ingenious extension of this plan was that of the Grosse Berliner Strassenbahn where ratios of traffic were shown by building up papier-mache strata on a route map. By this means, a route say with four times the traffic of another was shown by a wall four times as high. As the routes converged to one or two streets in the heart of Berlin they assumed a strong resemblance to a group of New York sky-scrapers.

The Philadelphia and Berlin schemes were excellent in convincing both the railway and the lawmakers of the need for traffic relief in the congested sections, but they were of no definite value in showing how car schedules might be re-adjusted, running speeds increased and stops decreased.

Vehicular Traffic Flow Diagrams.—The traffic density diagram of later years has become a still better proof in arguments for re-routing or new trackage by showing also the amount and flow direction of all other vehicular traffic. In almost every city such conditions as width of streets, paving and grades strongly influence drivers of other vehicles to use or avoid certain streets. Traffic flow diagrams reveal this tendency in a way clear enough to convince even an American alderman, thereby leading to traffic ordinances which may produce appreciable relief. Of course, the diagrams should also show the direction of flow and amount of car traffic. Often enough the latter will reveal possibilities that were not apparent in the same data when tabulated.

Other Graphic Records from Car Receipts.—It has also been customary for quite a number of companies to record the changes in traffic on a chart covering every day of the week and carrying notations thereon as to holidays, weather, reasons for unusual travel and the like. Such graphs make pretty pictures for comparisons with previous years but are rarely used for anything but horizontal cuts or additions to the service. How-

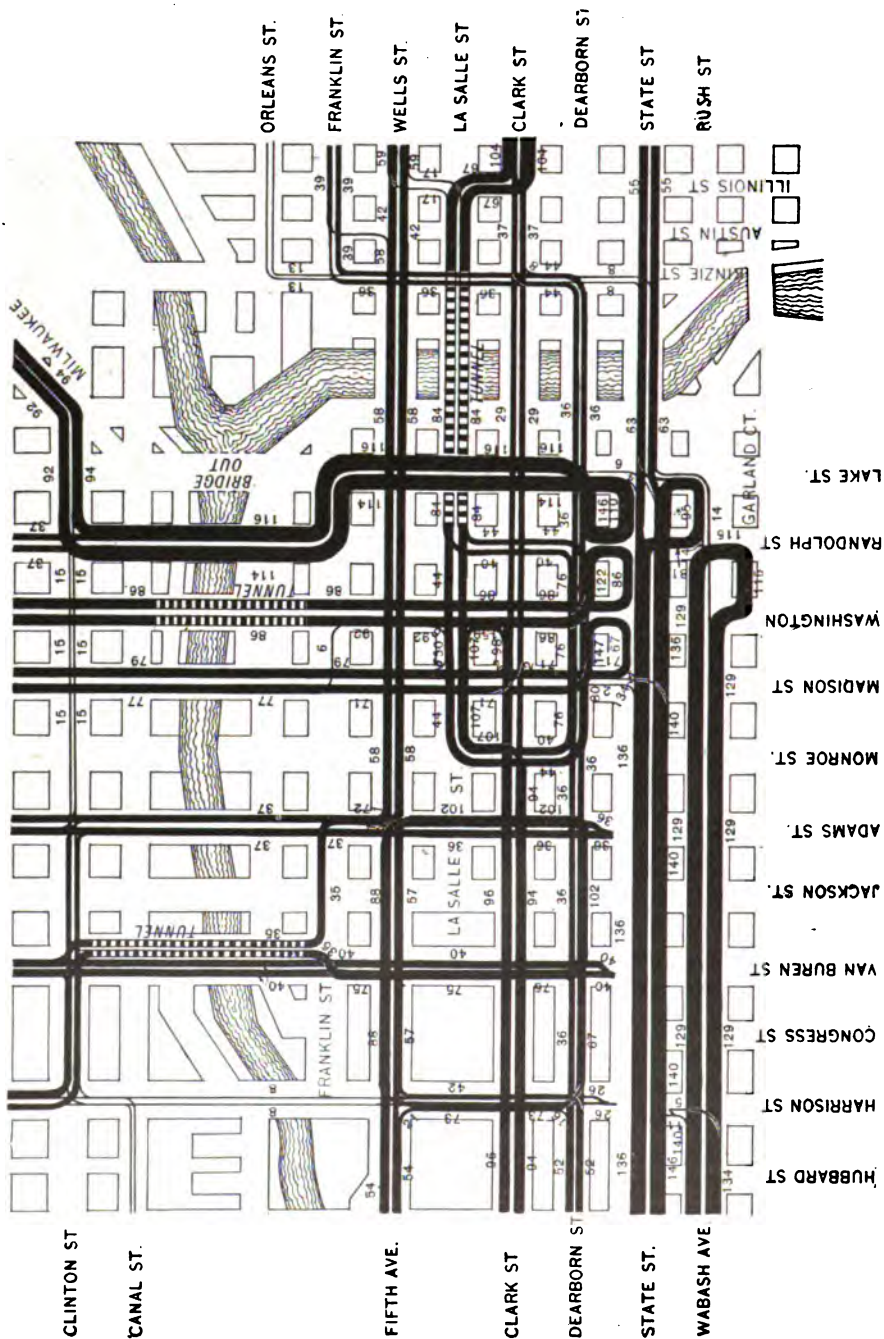


Fig. 9.—Rush-hour car flow map made from car count Jan. 8, 1915, 5.15 to 6.15 p.m.
 (From report of Board of Supervising Engineers, Chicago Traction.)

ever, when combined with a curve of platform and possibly other expenses they are of value in showing the relative cost of the service on different routes. One manager, in fact, used such a graph to convince a delegation of grumbling suburbanites that his company was losing money on a 10-ct. fare.

Make Traffic Counts of Midday Travel.—The modern traffic counting and charting practices hereinafter described have generally been applied to rush-hour conditions only. Still more good will be accomplished by analyzing the traffic conditions of the less strenuous periods. One is by no means merely a multiple of the other. If half the rush-hour riders are short-liners it does not follow that the fraction is the same during other hours. In some instances the midday travel has been neglected because the fact was overlooked that a moderate travel in each direction is more profitable and often larger in amount than when the cars are overloaded in but one direction only.

In other instances the midday travel remains stationary while the rush-hour business may double or triple in less than ten years. In other words, the peaks grow higher relatively as well as actually from year to year. This condition is by no means unusual on large city systems, although attention is seldom called to it.

Other factors which call for periodical checking are shiftings of business or amusement centers and deterioration from a good residence section to a slum with sweatshops within walking distance of the tenement roomers. Such changes may be as slow as a glacier on a day-by-day basis, but they are perceptible enough when checked year by year. In Brooklyn, for example, one district became Irish, German, Hebrew and Italian in turn within a period of twenty years. There was a practically complete shift every five years and the travel habits of the people varied almost as much as their languages. Such changes, of course, are peculiar to American cities with their large foreign element and their freer opportunities for geographical expansion.

If all-day traffic records are made, the company can handle its equipment of cars and men in the most profitable way. At the same time it can show its patrons and regulators at all times that the schedules are not unalterably fixed but are regulated in response to every change in conditions. The best arguments with which to meet the bombastic improvement (?) association man are figures and graphs which prove that the railway is giving as much and often more service than the revenue justifies. The railway that contents itself with categorical denials is no better than the kicker who complains without the formality of mentioning the time, the place and the car.

Checking the Load at Different Points.—The most common and least costly way of checking car loading is to take readings at important

loading and unloading points. For example, if the loading track is not a single place like a terminal, city hall loop or main square, readings should be taken at every important corner in the loading zone. The remaining readings should be taken at all interchange or transfer points and finally at some outlying point or two in what is really a purely unloading zone. It is very desirable to determine the point where the load is greatest for each direction of travel and where it drops to a point that justifies short-line cars. To determine only the latter fact alone is well worth the trouble of a traffic count. For example, the graph (Fig. 10) shows very clearly the variation in traffic density throughout a given line as checked at twelve points. This is for both inbound and outbound travel and, as usual, is checked against the seating capacity of the cars.

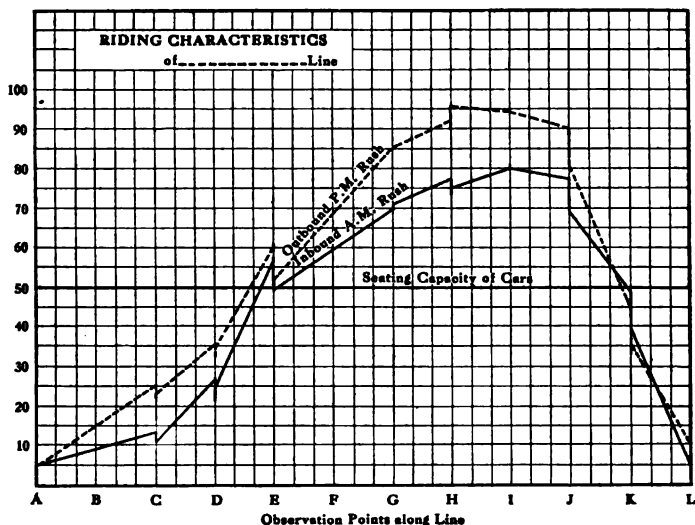


FIG. 10.—Variations in traffic density at twelve points along a line.

A series of such graphs, as reproduced from a report by the Board of Supervising Engineers, Chicago Traction, is of particular interest as showing the character of travel in opposing directions during the same hours. They are given in Figs. 11 and 12.

Possibly the simplest form of service chart is that used by the Portland (Ore.) Railway Light & Power Company, shown in Fig. 13. It is used chiefly for adjusting the peak service but, of course, it helps to disprove assertions about scanty service.

Owing to the lower density of population, as compared with eastern cities, it has been found feasible to have the data compiled by the conductor from a daily "Peak Load and Delay Card." For an outside

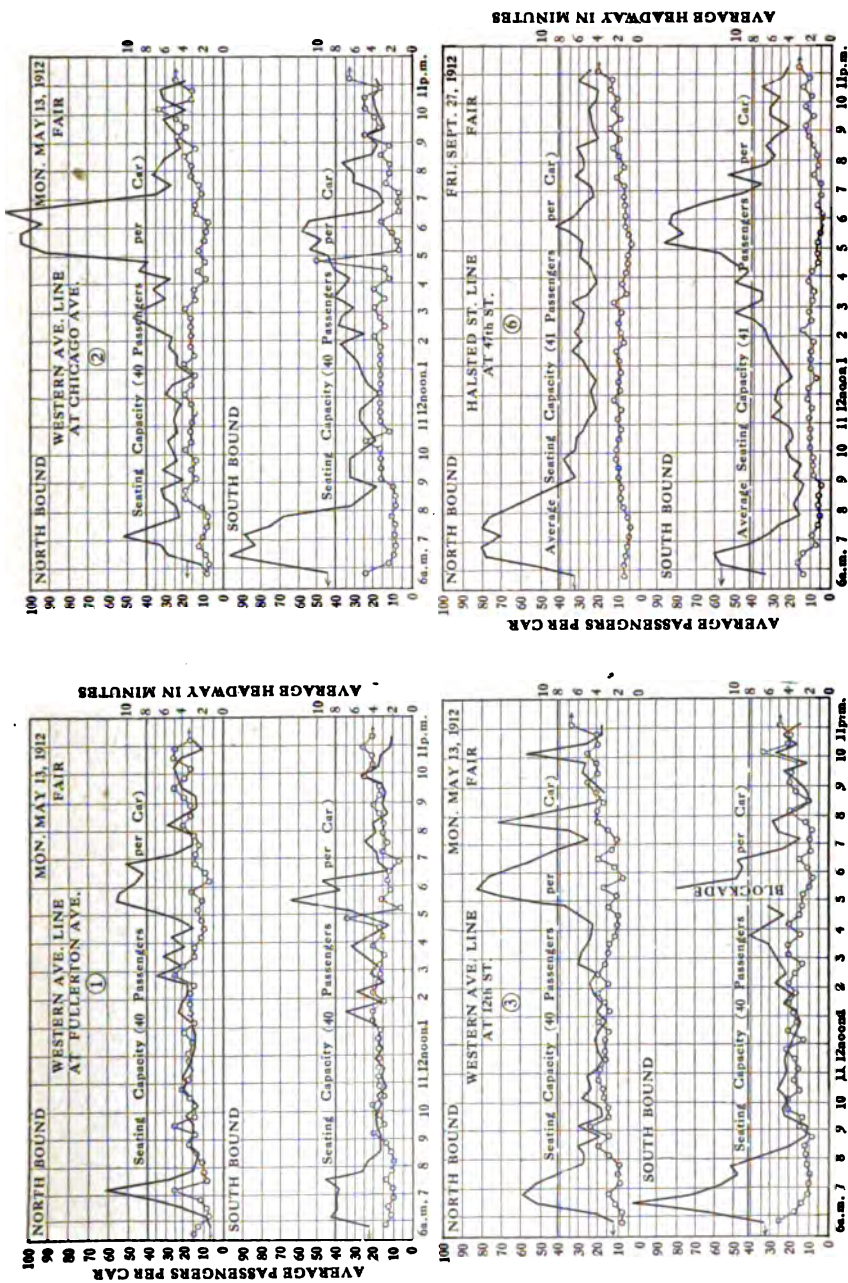


Fig. 11.—Variations in traffic on Western Avenue and Halsted Street lines, Chicago.
(From report of Board of Supervising Engineers, Chicago Traction, 1912.)

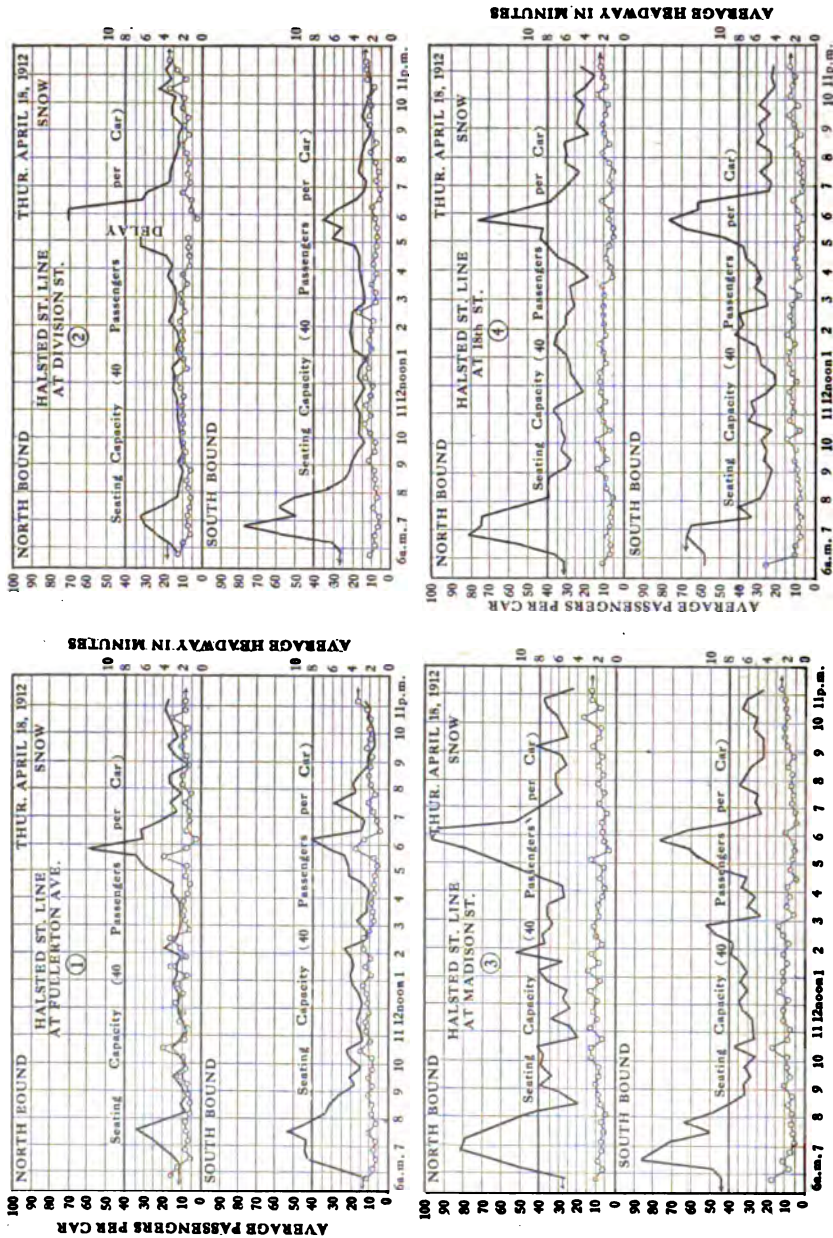


Fig. 12.—Variations in traffic at different points along the Halsted Street line, Chicago.
(From report of Board of Supervising Engineers, Chicago Traction, 1912.)

ADJUSTMENT OF SERVICE TO TRAFFIC

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PORTLAND RAILWAY, LIGHT & POWER CO.

Peak Load and Delay Card

Line.....Woodlawn.....Car....484.....Train.....3.....Run.....3.....
 Cond.....Simpson, D. P., No. 634.....Date.....6-2-15.....191.....

Sufficient cars are operated on every line to carry all normal traffic without overloads. If all seats are taken and there are thirty passengers standing, your car will be considered overloaded. Look at your watch and note exact time you arrive at peak-load point. If space is too small to explain cause of delay or overload, make note "—" and write explanation on back of this sheet.

Inbound at Union and Broadway				Outbound at Union and Broadway			
Time	Passengers	Minutes late	Cause	Time	Passengers	Minutes late	Cause
A.m.				A.m.			
6.04	25			6.31	08	5	Bridge delay
7.06	31			7.30	06		
8.13	34			8.35	08		
9.20	33			9.42	07		
10.22	18			10.44	14		
P.m.				P.m.			
1.28	44	4	Auto	1.46	21		
2.30	22			2.52	14		
3.32	31			3.54	19		
4.41	14			5.05	44		

PEAK-LOAD CHECK

By.....J. A. D.....6-23.....1915
 At.....Union and Broadway.....In

Line	Train	Car	Time, a.m.		Passengers
			Due	Arrived	
W. L.	5	566	6.22	6.22	35
W. L.	72	472	6.28	6.28	36
W. L.	6	574	6.33	6.32	37
W. L.	73	439	6.39	6.35	30
W. L.	1	479	6.44	6.45	45
W. L.	74	427	6.50	6.50	30
W. L.	2	485	6.55	6.55	28
W. L.	75	429	7.01	7.01	29
W. L.	3	478	7.07	7.08	56
W. L.	76	438	7.12	7.12	29
W. L.	4	565	7.17	7.18	52
W. L.	72	472	7.23	7.23	34
W. L.	5	566	7.27	7.29	52
W. L.	73	439	7.32	7.33	50
W. L.	6	574	7.38	7.38	50
W. L.	74	427	7.43	7.44	36

observer, of course, a notebook with properly ruled spaces and titles would be better. The peak load is taken as the number of passengers

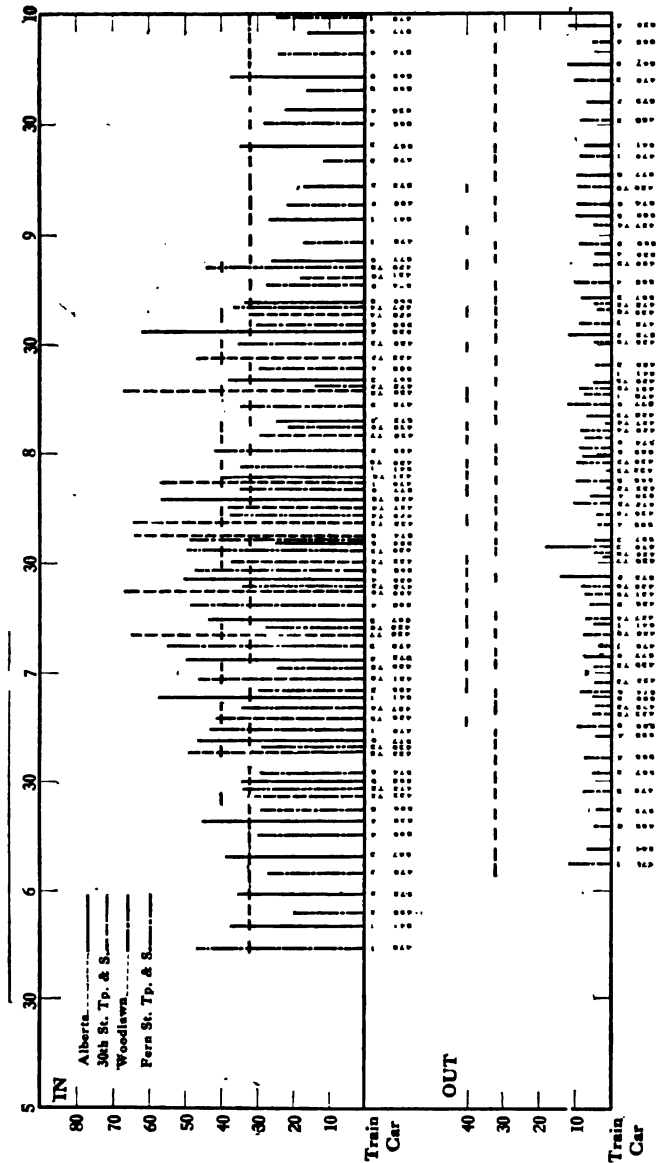


Fig. 13.—Portland (Oregon) conductors' and inspectors' peak-load slips reduced to graphic form.

on the car at the point on each route where experience shows the car to be regularly crowded the most, and beyond which the load commences to decrease. When passing this point the conductor records on each

trip the number of passengers in the car and the delay, if any has occurred. The peak-load card is also used to record delays and their causes—whether accidental or recurrent. These reports are supplemented by the inspectors who devote most of their time to checking variations in car spacing, but who also get enough loading figures to check the work of the conductors in part.

For the rush-hour periods these data are recorded on a chart as in Fig. 13. The length of the lines in the chart indicates the number of passengers, and the position of each line marks the time at which the car passed the corner established as the point where the peak load of its route may be expected. Different styles of vertical lines are used for each route where several overlap. The seating capacity of different styles of cars is shown by horizontal broken lines. This traffic chart is sent first to the division superintendent affected, then to the schedule

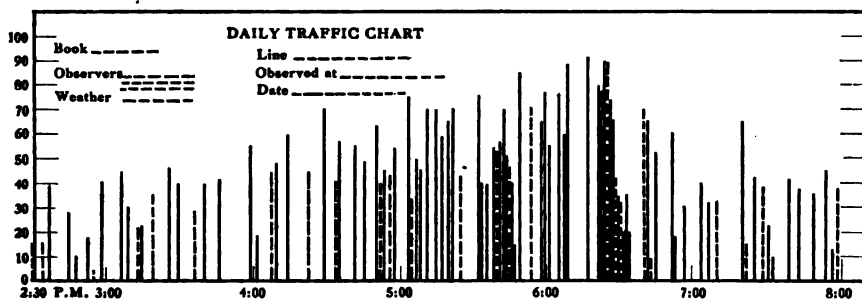


FIG. 14.—Intervals between cars of different routes as represented by full and broken lines, and variations in their loads, an extension of the Portland plan.

department and finally with combined comments to the superintendent of transportation.

A point worth noting on the Portland chart is the startling difference between the in and out travel.

An extension of the Portland plan, as applied by street checkers to a street over which several routes are operated is shown in Fig. 14. This chart as devised by C. M. Larson, chief engineer Wisconsin Railroad Commission, shows each car by a full or broken line according to its route. The height of each line shows the load and the contiguity of lines the congestion at certain periods. In this case the seating capacity was omitted, presumably because of the variety and number of cars. However, it is usually possible for an experienced checker to estimate the loads quickly and accurately as he is already familiar with the seating capacity of each car type.

In extensive traffic counts, such as made in Milwaukee by the Wisconsin Railroad Commission, the relation between passenger traffic and seating capacity was made continuously for normal as well as

rush hours. The comparisons were made on a 15-min. basis, an interval which allows the absorption of inequalities in car loading due to congestion and other causes.

Standing by Preference.—An interesting point developed in this and other investigations by regulators is that of standing by preference. Passengers who stand have been divided into three classes: Those who do so because they want to smoke on the platforms; those who prefer to board the first car that comes along, even if all the seats are occupied rather than to wait for a less crowded car, and those who stand in preference to crowding where they are obviously not wanted.

The first class, smokers, is getting smaller every day because of the more widespread use of fully vestibuled non-bulkhead cars which use is often followed by the prohibition of smoking.

The second class has found but too often that the "car behind" was no better than the car ahead.

The third class is noted chiefly on half-loaded cars with cross seats which are too narrow for a pair of good-sized persons.

Records of Adherence to Schedules.—Records of adherence to schedule are of the greatest importance in using each car as planned. It does little good to start cars from the depot at regular intervals if they are to run haphazard on the line. Irregularities in schedules may be due to indifferent time-point operation by the trainman or to roadway conditions beyond the direct control of the company. In either case, a picture of conditions will hasten improvement more than tabulations.

The engraving, Fig. 15, shows a time-load graph as developed by the Pittsburgh Railways. This graph indicates whether each car passing a fixed point of observation is ahead or behind its schedule and it also shows the load on the car. The point of observation is generally taken at the point of maximum load for the route as indicated from the characteristic load curve of the route. The vertical lines indicate the times when successive cars are due at the point of observation. The circles indicate the time when the cars actually pass the point of observation. When the circles lie at the right of the vertical lines it shows that the car in question was behind its schedule. When the circle falls to the left of the vertical lines it shows that the car in question was ahead of its schedule. Results from three or four successive days are placed on the same sheet so that conclusions may be drawn without requiring dependence upon a single set of results.

On the Public Service Railway, the time-load data are placed on passenger count charts like that shown in Fig. 16. The car timer at the point where traffic is heaviest puts down on a standard form the car number, train number, the time the car reaches him and the number of passengers on the car. After the rush-hour count is completed the

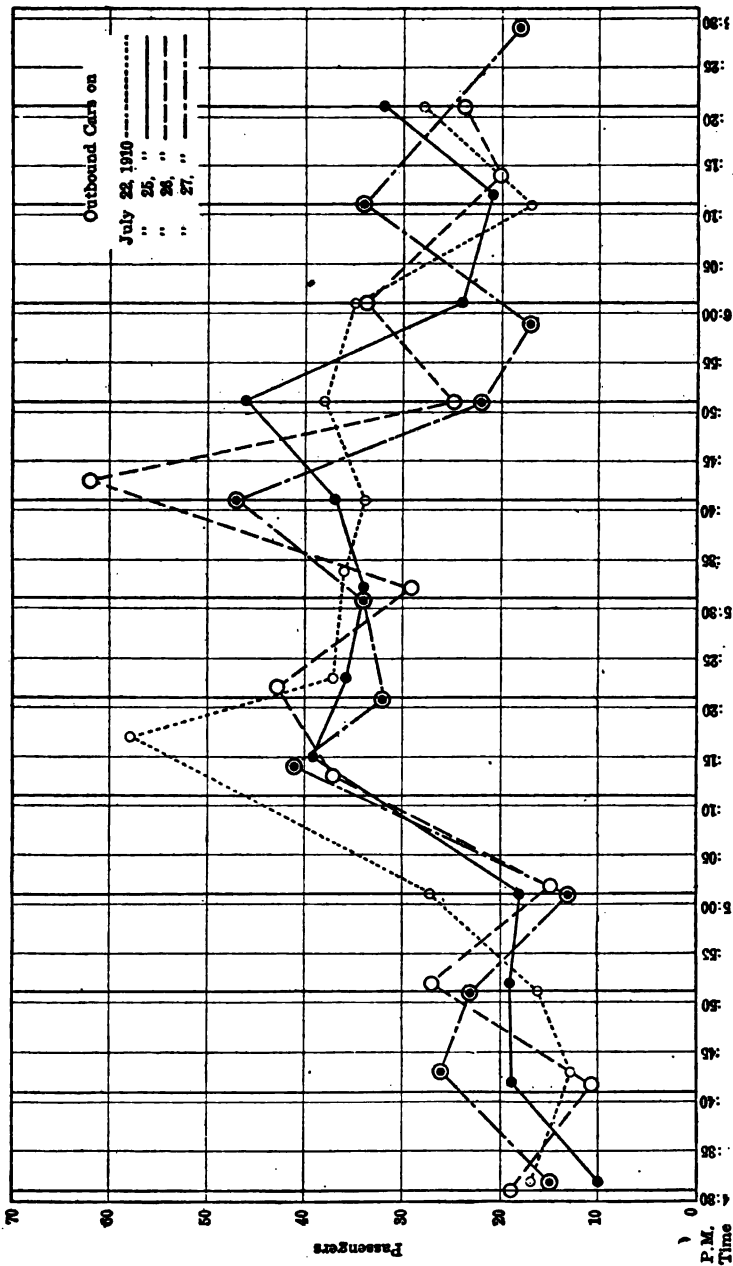


Fig. 15.—Pittsburgh traffic-time-load graph for four days at typical city time points.

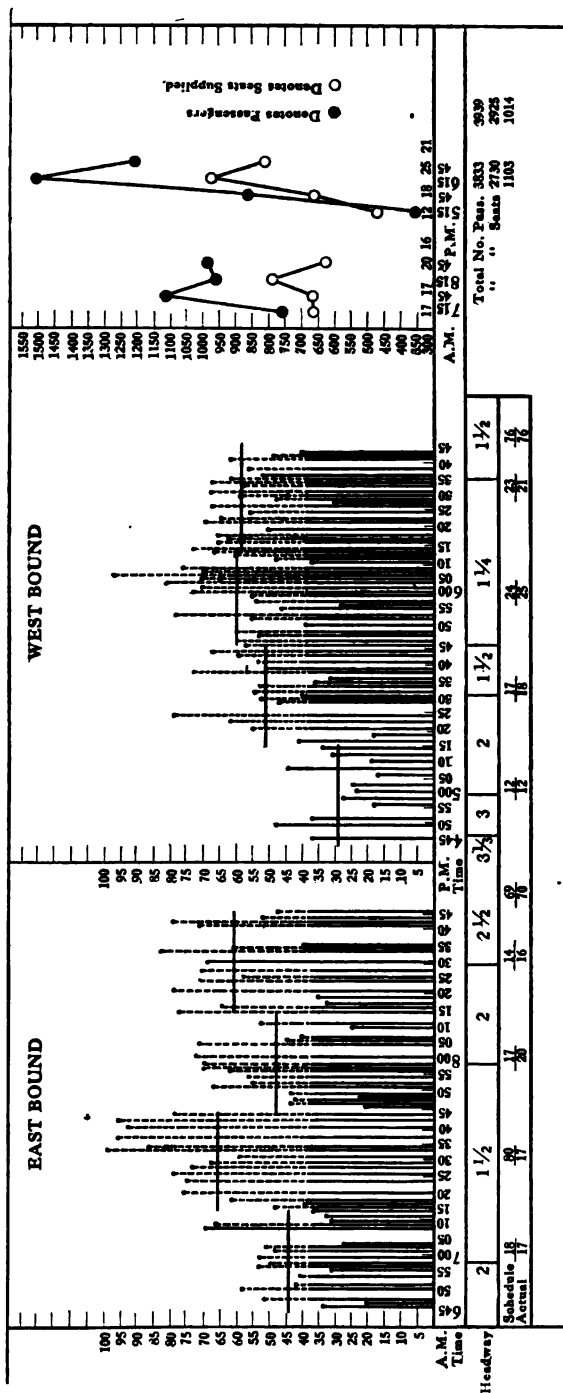


Fig. 16.—Passenger count taken (on cross-section paper) in direction of maximum a.m. and p.m. traffic, Public Service Railway.

observer goes into the office and makes a record on cross-section paper. This chart, when completed, shows the number of passengers on each car and the time the car passed him, the scheduled and operated headway, the number of cars scheduled to pass and the number operated in 30-min. periods and the number of seats supplied. The finished chart will show whether the schedule has been maintained as to headways and the number of cars operated; also if sufficient service is being given to take care of the business properly.

Headway Tabulating Device lately used in Brooklyn.—The Brooklyn Rapid Transit System, surface division, until recently used a tabulator which furnished graphic records showing the relation between seats and passengers so that the chief dispatcher could concentrate attention solely on those portions where modifications were necessary. It proved exceedingly valuable, but was superseded because the Public Service Commission preferred figures. This device, which is illustrated in Fig. 17, consists of a metal case, beneath the open face of which is passed, by means of tangent screws, a continuous strip of cross-section paper 4 in. wide, upon which the record is made. Directly above the open face is a double-graduated scale carrying two sliding circular punches of different diameters.

Holding the instrument in one hand, the observer moves the paper so that the time units appearing along the median line of the record pass the edge of the graduated scale to correspond with the actual time as shown by a watch carried on the wrist. As a car approaches, the known seating capacity is recorded by moving the larger diameter punch to proper position on the graduated scale and depressing for perforation. As the car passes the observer, the load carried is recorded in a similar manner by setting and depressing the smaller punch.

The portion of the record published in Fig. 18 is a typical one taken from the records furnished by an observer to the chief dispatcher. Above the middle line, reading from this line up, is the record of eastbound service, while the corresponding westbound service, read from the bottom of the sheet, appears below. The vertical intervals on the record cor-

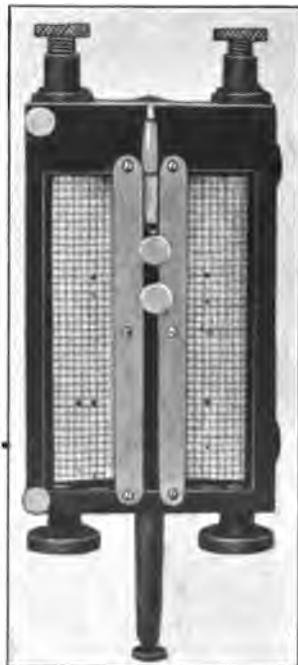


FIG. 17.—Headway tabulating device, Brooklyn Rapid Transit System.

respond to five seats or passengers and agree with the graduation on the scale. The horizontal intervals correspond to 2 min. of time, each 10-min. interval being represented by the heavier line.

The perforations are read in pairs, an overload being indicated when the smaller circle appears above the larger, and an underload when the converse appears. The amount of overload or underload is the vertical distance between the larger and the smaller circle, commuted into passengers by the equivalent of five passengers for each vertical interval of the record paper. Aside from indicating whether insufficient or excess service is being operated, the record shows clearly all irregular headways arising from blocks or other causes. When operating deficiencies are apparent blueprints may be made directly from the original record and forwarded for attention to the assistant superintendent concerned.

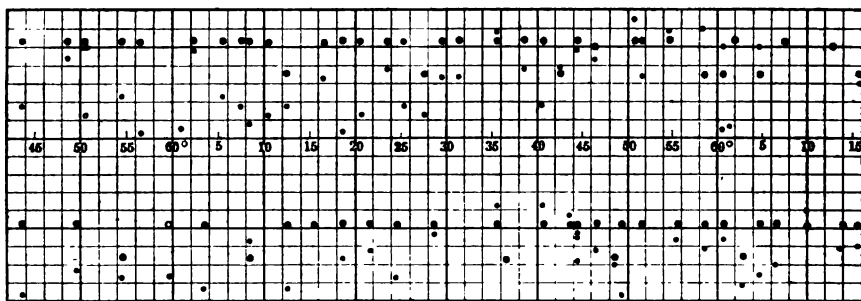


FIG. 18.—Portion of record made with headway tabulator.

Before the introduction of this instrument like data were obtained in the form of a numerical equivalent. Not only were the compilations laborious, but the mass of resultant figures tended to confuse and had the additional objection that they represented so much wasted energy when they were indicative of satisfactory service on the line.

With the graphic record minute analysis of a dozen lines consumed less time than a single line did under the old form, which is quite an item on a system comprising more than seventy lines. The chief value of the tabulator lay in the fact that it enabled the chief dispatcher to cover all lines more frequently and thus keep in closer touch with changing conditions and their corresponding requirements.

For the elevated division a modification of this device is in use, overload and underload being blocked out in different colors at horizontal intervals corresponding to headway. A similar record of service is kept on the elevated lines by clerks in the signal towers, who make a tabulated record as the cars pass. Employees assigned to the prepara-

tion of these two types of records become very expert, not only in the manipulation of the instruments, but also in determining loads. The basis of the latter calculations is the known seating capacities of the various types of cars.

No difficulty has been experienced in the calculation by employees of load conditions of cars. The men who make the records know the seating capacity of the various types of cars operated and are able to determine quickly the approximate number of passengers standing in case of a standing load and the number of vacant seats in cars in which all the seats are not occupied.

Boarding and Alighting Records of the Public Service Railway.—

When a closer count than street checking affords, is desirable, distribution charts covering the performance of an individual car throughout a certain trip may be made with two men per car for as many cars as is thought necessary. As carried out by the Public Service Railway, Newark, N. J., one man is stationed at the rear platform where he records the name of the street at which each stop is made and the number of passengers boarding and alighting from the car at each stop. The other man, who is stationed near the front door, keeps a record of each street at which the car stops, the number of passengers leaving the car from the front platform at each stop, the time of arrival at each time point along the line, and, with a stop watch, the time in seconds for each stop. Thus the data required for calculating the time of passenger interchange may also be worked out where loading comparisons of different types of cars are wanted.

This joint record is brought into the office and profiled. The completed chart, which shows passengers on the vertical scale and the length of the line in miles on the horizontal scale, indicates where traffic originates and how it is distributed. A load line is then developed from the continuous sum of passengers on and off. This line starts at zero at the beginning of the trip and returns to zero when all passengers leave the car at the end of the trip, thus forming with the base line a closed area. The area, which has passengers for abscissæ and miles as ordinates (see Fig. 19), may be obtained by means of a planimeter and may be expressed in passenger miles. Then, by dividing the passenger miles by the total number of passengers boarding the car during the trip, the average length of ride per passenger is obtained.

The average load on the car for the trip is reached by dividing the passenger miles by the length of the trip in miles. From the total number of passengers carried, and the stop-watch record of length of stops, the average time per passenger interchanged and also the average length of stop are computed.

Other data which can be calculated from this Public Service record

are: first, the percentage of passengers alighting from the front and rear platforms respectively; second, a separation of passenger stops and those due to delays from various causes, such as traffic regulations, vehicular interference, trolley pole trouble, throwing switches, etc.; third, average number of stops per mile; fourth, the actual trip speed, and its relation to schedule speed; also the trip speed with stop time excluded, which with braking and acceleration time excluded will show

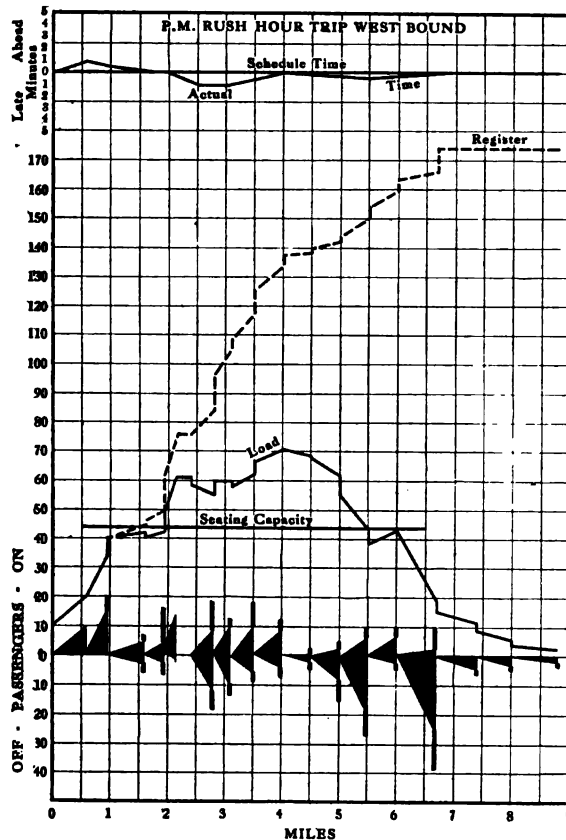


FIG. 19.—Traffic distribution chart, Public Service Railway.

free running speed. Further, if the front observers noted that the motormen are continually running on series position when not interrupted by traffic, it is clear that it is safe to make a cut in the running time and to speed up the line.

Previous to inaugurating a short-line service, a series of distribution charts is taken to show where most of the short riders board and leave the cars, to ascertain the distance of short haul. The turn-back point

can then be arranged to be just outside this short-haul district, thus giving the greatest amount of service without any waste mileage or waste platform expense.

Again on a line with two or more fare zones the question of equitable division points arises. These zones are usually defined carefully by franchise regulations, but if the franchises have left any flexibility as to their location, the distribution chart will show the average length of ride per passenger on the line in question. With this length of ride known and used as a basis, fare zones of equal and reasonable length can be established.

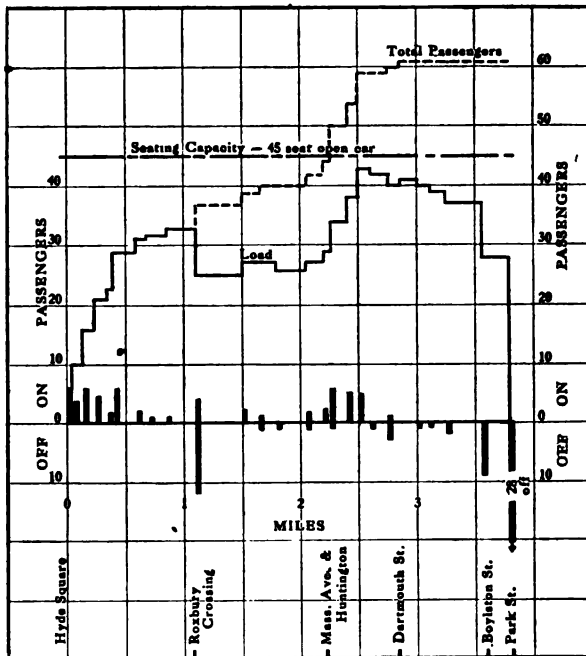


FIG. 20.—Boston chart plotted from data in notebook shown on page 38.

This distribution chart will also show the standing limit as follows: Draw a horizontal line above the base line showing the rated seating capacity of the car, and the final point where this line intersects the load line will show the last point on the route where passengers were compelled to stand. It will also show enforced standing is short in duration so far as it applies to individuals because of the constant interchange of passengers along the line.

Boston Checks with Aid of Technical Students.—A system like that of the Public Service Railway has also been used by the Boston Elevated Railway, the inspectors employed having been some students from the

Massachusetts Institute of Technology. In this check it was found that one experienced observer per car was enough for most of the runs, although for extreme accuracy two men might have been better. Cars with single entrance and exit, such as center-entrance, near-side and Boston articulated types, are easy for one man; while cars with entrance and exits at opposite ends will offer less difficulty if the observer checks

BOSTON ELEVATED RAILWAY—ROUTE 279

Hyde Square—Roxbury Crossing—Subway Inbound, Tuesday, Aug. 11, 1914.

Leave Hyde Square, 7.22 a.m.; arrive Park Street Subway, 7.49 a.m.

Total passenger-miles..... 116

Total number of passengers..... 61

Average ride per total-passenger = 1.90 miles.

TABLE SHOWING FORM FOR RECORDING DATA IN TRAFFIC COUNT

Route 279. Inbound, Aug. 11, 1914. Start 7.22 a.m. Arrive 7.49 a.m. 45-Seat
Open Car

Stop	On	Off	Load	Cash	Transfer
Hyde Square	6				
Forbes Street	4		10		
Wyman Street	6		16		
Mozart Street	5		21		
Bickford Street	2		23		
Wise Street	6		29		
Old Heath Street	2		31		
New Heath Street	1		32		
Cedar Street	1		33		
Roxbury Crossing	4	12	25		1
Ruggles Street	2		27		
Walpole Street	1	1	27		
Benton Street		1	26		
Massachusetts Avenue	2	1	27		
St. Botolph Street	2		29		
Massachusetts and Huntington	6	1	34		1
Norway Street	4		38		2
West Newton Street	5		43		
Garrison Street		1	42		
Exeter Street	1	3	40		
Dartmouth Street	1		41	59	
Clarendon Street		1	40		
Berkeley Street		1	39		
Arlington Street		2	37		
Boylston Street		9	28		
Park Street		28	0		
	61	61		59	4

BOSTON ELEVATED TRAFFIC—TABLE SHOWING FORM FOR RECORDING DATA BY
OBSERVERS ON CAR

his counts frequently by adding up the total passenger load on the car. On Boston work done during 1914, one observer handled a trip carrying a total of 203 passengers with a maximum load at one time of 134.

A pocket-size, loose-leaf notebook was used at Boston. The accompanying table shows the way in which the notes were kept, and the diagram shown in Fig. 20 is the load graph drawn from these notes. The heavy black lines indicate the interchange of passengers at the various stops, those above the base line representing the number getting on, while those below represent the number getting off. The solid black line represents the load actually on the car at every point and will be found to check at any point with the total number boarding minus the total number leaving up to that point. The broken line simply gives the cumulative totals of all passengers boarding. It should be stated that the average distance between stops on this route is abnormally long because of partial subway operation. This makes checking easier.

Pittsburgh Street and Car Checking.—The Pittsburgh Railways uses its checkers for both street and car observations. In the latter case each one observes and records the number of passengers on and off at each stop. Each one also records the time of arrival at certain fixed time-points, to show whether the car is ahead of or behind its regular schedule. The total running time for the trip is also recorded and notes are made to cover any unusual delays.

The results are entered in a "checker's report." This report contains a space for the routing, generally given by number as well as destination, time of starting the trip, the number of the car, the date, the direction, the train number and the weather. The body of the report contains a list of all points where stops are made. These names are entered by typewriter because only a comparatively few records are made on any one route. Certain stops are permanently established as time-points, and these are indicated in the report by asterisks, the checker putting down the time of arrival whenever the car reaches one of these points. In the report are columns headed "Passengers On" and "Passengers Off," the latter column being halved to provide space for the passengers leaving via the front of the car and for those leaving by the rear exit. Transfers are not registered on the Pittsburgh Railways so that in order to obtain the check from the register reading at the end of the trip the passengers who present transfers are reported separately, and the number is circled.

At the end of the line the figures are totaled to show the number of passengers boarding the car, the number leaving by the front exit and the number leaving at the rear. The total number of cash fares is then entered and the number of transfers added to this, the whole affording

a check against the total number of boarding passengers. Spaces are also provided at the end of the report for the scheduled time and actual time of leaving the city and also for the time when the car is due at the end of the line and when it actually arrived.

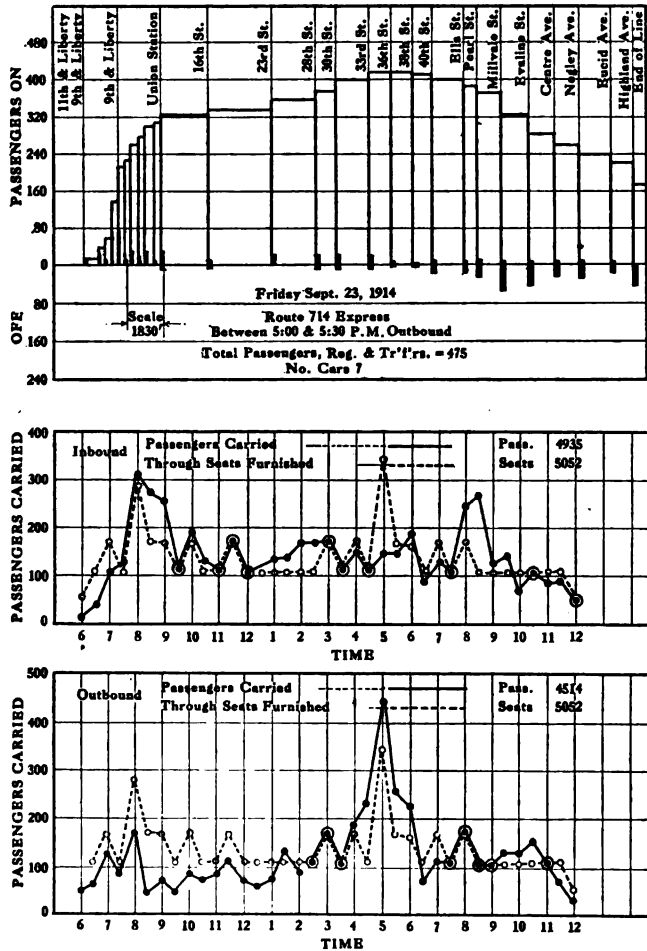


FIG. 21.—Pittsburgh suburban line. At top, traffic graph of suburban line showing results with seven cars; at center and bottom, half-hourly load graphs for same route, inbound and outbound.

The different time-points are written on the back of the checker's report and the running time between each successive pair is calculated and entered in a column paralleled by the scheduled running time between the time-points. In addition space is provided for comment regarding maintenance of headway, adequacy of service, whether the

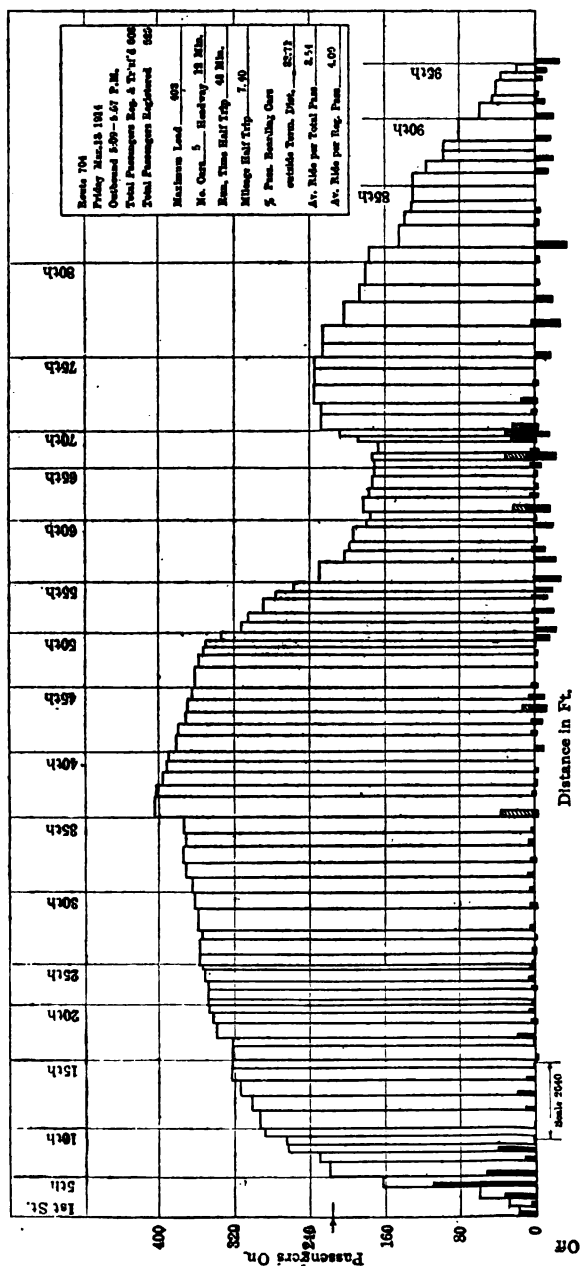


Fig. 22.—Pittsburgh city line. Traffic graph of typical city route showing results with five cars.

car carried the proper signs and markers and whether the train number is correct and in proper place.

From the average of all checker's reports that are turned in each day, the characteristic graph of the route under observation is made up. Then the mean length of ride per passenger is calculated by the planimeter in the way described in connection with Fig. 19.

The characteristic graph of a route is also used to establish the relation between the total number of passengers carried during any trip and the maximum load on the car at any one time. This figure is obtained as a percentage by dividing the maximum number of passengers on the car at one time, as shown by the high point in the load line, by the total number of passengers boarding the car, as shown by the number of fares and transfers indicated on the conductor's trip sheet. Experience has shown that the percentage of short-riders varies but little on any given route.

Two typical traffic charts are shown in Figs. 21 and 22. One is for a Pittsburgh suburban run with a limited number of stops and the other is a typical city run. These graphs are made up in accordance with a fixed horizontal scale representing distance so that the mean length of ride may be accurately fixed by the method outlined.

From the characteristic graph for the lines on any one street a combined characteristic graph for all

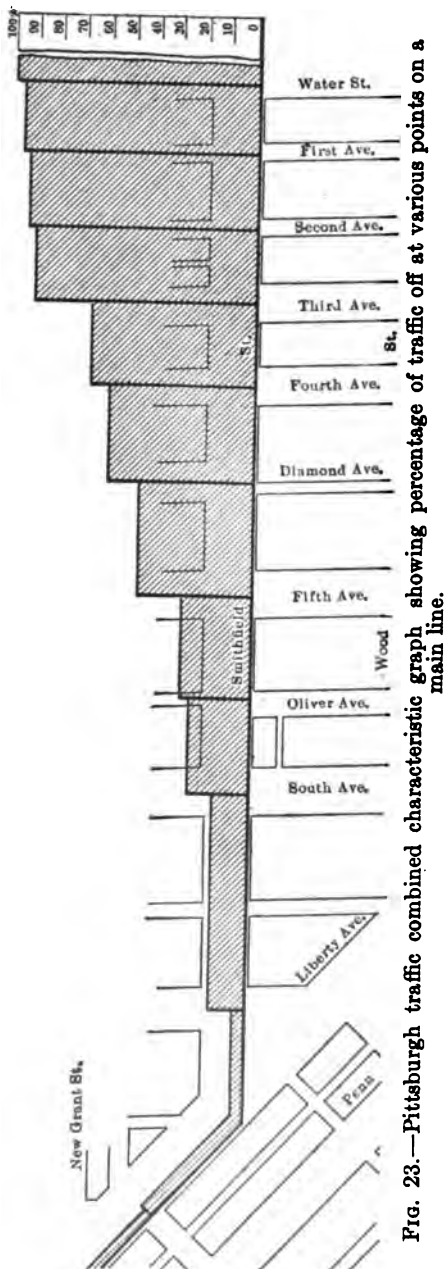


FIG. 23.—Pittsburgh traffic combined characteristic graph showing percentage of traffic off at various points on a main line.

lines on the street may be obtained. One of these combined characteristic graphs, reproduced in Fig. 23, shows the conditions existing for inbound traffic on Smithfield Street, one of the main lines entering the business district of the city. From this it will be seen that less than 30 per cent. of the passengers entering Pittsburgh on all of the lines on this street ride past Fifth Avenue and that only about 5 per cent. ride to Liberty Avenue. Obviously this diagram is an unanswerable argument in case complaint is made about infrequent service on through lines past the latter street, as the convenience of only 5 per cent. of the riders should not reasonably necessitate the running of all cars that enter the city on Smithfield Street through to Liberty Avenue.

From time to time the characteristic graphs on each route are checked by placing men at points of change in the rate of loading, as indicated by a general change in the direction of the traffic load line. This work is done only when conditions are changed owing to re-routing or when some other outside influence has been introduced. These checks are made by having the observers report the number of passengers on every car that passes the point at which they are stationed. When the results of their observations are averaged, a new line is plotted which resembles the characteristic graph for the route except that it shows diagonal lines extending between points of observation instead of the broken line of the exact records of the characteristic graph. The difference between the two is that the check line applies to every car on the route and is exact only in so far as it applies to the points of observation. The characteristic graph is exact with regard to the particular cars upon which observations are taken, but the diagram naturally applies to every car on the route only upon the assumption that the records of the cars that are observed are typical of all.

Observations by men stationed at fixed points are also taken to determine whether the service on any line is ample. Such observers are placed at the point of maximum load indicated by the characteristic graph for the route. The observers record the total number of passengers on each car passing the observation points during the evening rush hour, and through experience they are able to determine closely the number of passengers on cars which do not even stop at the point of observation.

The traffic department of the Pittsburgh Railways also prepares a 30-min. load graph for the individual routes by totaling the number of passengers riding on each car on the route as indicated by the conductor's trip report or day card. The points on the graph show the number of passengers riding on all inbound cars leaving the outer terminal of the line during each 30 min. and on all outbound cars leaving the business district of the city during each 30 min. The figures for

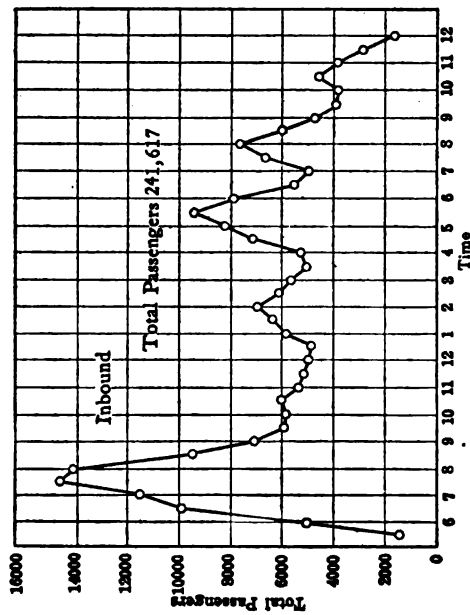
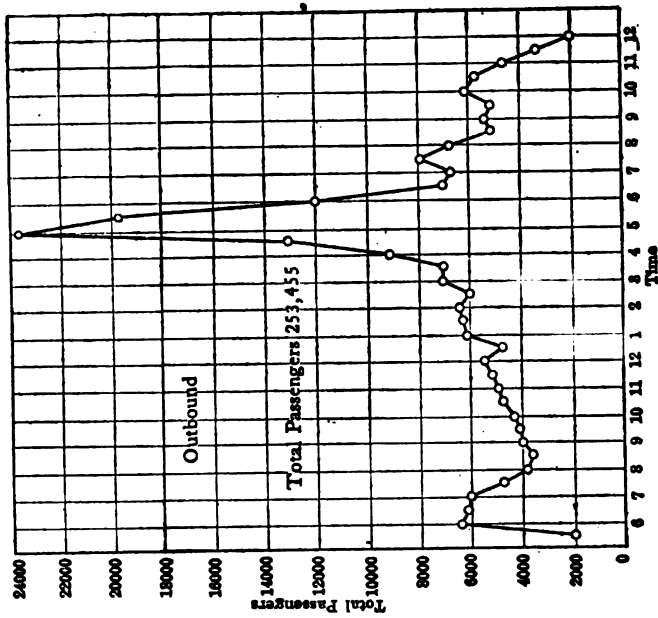


Fig. 24.—Pittsburgh traffic. At left, half-hourly load graph for sixty-six routes inbound; at right, graph for same routes outbound.

outbound and inbound cars are separately summarized and plotted.

From time to time the results obtained on the different routes are summarized and shown in a 30-min. load graph for all routes. Two of these graphs are given in Fig. 24, one for outbound cars and one for inbound cars. These show the total number of passengers carried on the sixty-six routes entering the business section of the city for one day, based on a five-day average.

In some cases the total number of through seats furnished is determined from the number of cars in service during the different 30-min. intervals, and the results are plotted on the same sheet to show the relation between the two figures during the different hours. Of course, the number of passengers carried does not serve as a measure of the maximum number of passengers on the cars at any one time, but this has been found to be a reasonably constant percentage of the total number of fares paid and transfers turned in on any particular route. As a result this figure may be obtained directly from the individual load graph and plotted below it, thus showing the number of standees, if any, during the rush hour.

Chicago Record Chart.—R. F. Kelker, Jr., in charge of the transportation bureau of Chicago's Department of Public Service, has recently devised a service record chart which at once indicates to the Chicago alderman the service condition existing at certain fixed points during certain periods of the day. As shown in the reproduction in Fig. 25 of one of these charts, the white space in the center of each ring represents the number of seats, and the black area surrounding it shows the number of passengers standing.

While this chart does not show the instantaneous peaks at any one period, it does indicate the average number of seats offered to the total number of passengers during any half hour between 4 o'clock p.m. and 7 o'clock p.m., which comprises the evening rush period. In addition to the diagrammatic indications, the actual number of seats offered and the total number of passengers carried are also shown in figures. The circles on each horizontal line show the condition at any single checking station for each of the 30-min. periods, and the circles in the vertical columns show, comparatively, the character of service rendered in each period at each checking station. Many other interesting facts may be obtained from a study of this chart, such as the routes which carry the maximum and the minimum number of passengers during any 30-min. period, and the comparative service offered by these routes at the different checking points.

Philadelphia Traffic Counts by Passenger Interview.—The most comprehensive traffic count ever undertaken was that conducted for the city of Philadelphia in 1913 by Ford, Bacon & Davis. The reason

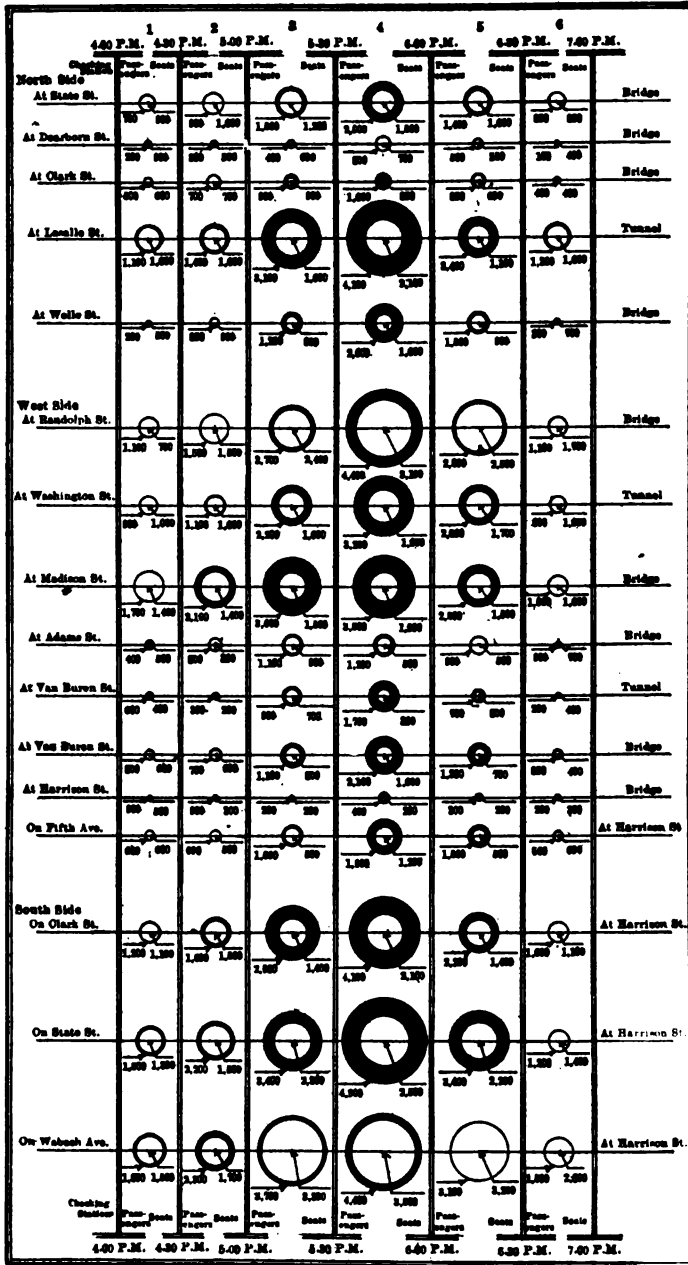


FIG. 25.—Chicago service record chart.

for this count lay in the fact that the city was planning an extensive network of subway and elevated lines. It was, therefore, desirable to have, first, an exact picture of traffic conditions as they existed; and, second, all data that might be of use in forecasting the amounts and directions of travel in the future, assuming the construction of certain routes.

The different methods of traffic counting hereinbefore described were rejected as inadequate for the purpose in hand. The city got many of the desired data from the passengers themselves as follows:

Two observers were placed for a business day on every fifth car on different lines in turn. As each passenger entered the car the first observer handed him a card bearing the name of the street at which he boarded. As soon as the passengers were settled after each stop, the second observer went through the car asking of each card-holding passenger his ultimate destination and route, collecting the cards and filling them out with this information. At the end of the trip the cards were inclosed in an envelope with the identifying data as to date, time, route, trip, car, etc. The records obtained on the card may be summarized as follows:

Time of day.

Route of car.

Direction.

Street at which passenger boarded car.

Street corner to which passenger was destined.

Route on which destination was located if reached by transfer or exchange ticket.

Fare presented—whether cash, exchange ticket, transfer or free.

Transfer or exchange ticket issued, if any.

These data were transferred to cards by means of an electric tabulator, and the cards were then separated into 113 traffic sections. Each section was noted for the following:

Population in 1913.

Land area in acres available for residence.

Density of population per acre.

Rides originating on day of survey.

Equivalent revenue, year to June 30, 1913.

Rides per annum.

Revenue per capita, year to June 30, 1913.

The information thereby secured made possible definite conclusions as to the probable riding on the proposed extension system of subway and elevated lines, which later was recommended by the director of city transit. Without a survey of this kind it is impossible to foretell with certainty the extent of travel on new traffic routes. The cost of such a survey necessarily is heavy in the wages of the many persons engaged,

the elaborate forms and tabulating machinery and in the widespread advertising to apprise the public that their intelligent co-operation is needed, but this preliminary work is well worth while if it saves an expensive mistake. However, adjustments in service on existing lines can be made without going to the detail of the Philadelphia plan.

Boston Traffic Count by Passenger Interview.—A modification of the traffic count method used at Philadelphia was employed by the Massachusetts Institute of Technology in 1915, to determine the actual length of ride on six surface lines of the Boston Elevated Railway. According to an account by D. J. McGrath, research assistant of the institute, a party of eight senior students in the electrical engineering course at the institute volunteered to perform the work of securing and tabulating the data as their thesis.

The willing attitude of the general public of Boston was the one most essential factor in the success of this work. Out of about 10,000 persons questioned only an occasional refusal to give information was met with.

The inbound traffic on six representative lines of the surface system was studied, as well as the outbound traffic from the center of Boston on the north and southbound rapid transit line. The amount of data thus obtained came from only a comparatively small portion of the total passenger traffic in and about Boston, and to make a thorough investigation of this system would require a somewhat more extensive campaign. The main object of this particular investigation was to prove that it is both possible and practicable to determine with some accuracy the proportion of passengers taking rides of various lengths on a complicated city electric railway system.

The results as presented by Mr. McGrath in the following discussion are valuable in that they demonstrate these important points:

1. That there is a very considerable amount of passenger traffic throughout the city riding 5 miles or more for 5 cts.

2. That the amount of extremely long riding, such as from one suburb through the center of the city out to another suburb, is appreciable but not abnormally large.

3. That there is a considerable amount of short riding of 2 miles or less for the same fare, 5 cts.

4. That it is evident on all the lines studied that the average transfer-passenger rides further than the average non-transfer passenger, and, moreover, the average length of ride is still further increased for those passengers using double and triple free transfers, as is possible on the Boston system.

5. That the average length of ride, from start to ultimate destination, of passengers originating on the lines studied, is as follows:

Route	Miles
212, Jamaica Plain to Park Street, Subway.....	2.9
419, Orient Heights to Scollay Square.....	3.0
661, Linden to Sullivan Square ¹	5.4
705, Harvard Square to Subway via North Station.....	2.7
762, Arlington Heights to Harvard Square ¹	5.8
907, Newton and Brighton, Park Street to Subway.....	4.3
907, Newton and Brighton, Park Street to Subway.....	4.5

The two counts on the last-named line were made on different days of the week and on a different running schedule for the observers, the results checking remarkably well.

In order to obtain data in the matter under inquiry, it was necessary to determine in some way the origins and destinations of a representative number of passengers on representative lines of the whole railway system. After formulating and discussing a number of possible plans, it was finally decided to place two observers on inbound surface cars of

			BOARDED	Nº 6258
PLEASE KEEP THIS CARD FOR THE COLLECTOR.				
<p>The Boston Elevated Railway is co-operating with the Massachusetts Institute of Technology which is making a study of transportation in a number of cities.</p> <p>Your co-operation is desired and will be appreciated.</p> <p>Please inform the <i>collector</i> where you are going on the cars, that is, your <i>final destination</i>, and if change of cars is to be made state the route you intend to use.</p> <p style="text-align: right;">Boston Elevated Railway Co.</p>				

FIG. 26.—Sample of traffic count slip used on Boston surface lines.

the lines chosen, these men to note the street where each passenger boarded the car and to learn by directly questioning the passenger his intended ultimate destination route.

As the traffic on these lines is quite heavy and the number of men available for the work was limited, only a part of all the trips run on a given line on the day of the count could be covered. Only inbound traffic was studied, as the fare and transfer system in the intown stations is so complicated that it would require a second question to learn the point of origin of outbound passengers. The reasonable assumption was made that outbound traffic on the lines studied would probably be substantially the reverse of the inbound.

¹ At these points, passengers transfer (free) to the rapid-transit trains, which take them in to the center of Boston.

A sample of the form of traffic-count slip used in this work is shown in Fig. 26. An individual slip was presented to each cash fare-paying passenger as he boarded the car, one of the observers being stationed at the prepayment entrance of the car for this purpose. In the upper space on the slip, marked "boarded," this observer wrote a number designating the street at which the passenger boarded and then handed the slip to the passenger who carried it to his seat. The second observer went back and forth through the car, collecting the slips, asking the necessary questions, and recording the answers on the slips.

Two pairs of observers were assigned to each line, and they worked practically continuously from 7 a.m. to 7 p.m. on a schedule prepared in advance. Although only a portion of all the trips was covered on any one line, it is confidently believed that sufficient data were obtained to be representative of average conditions. This belief is supported by the close correspondence of the results obtained on the two different days chosen on the Newton-Brighton line to check the accuracy of the method.

In the investigation of the traffic outbound from the center of the city on the line of the Washington Street subway a different procedure was followed. The Winter Street station was chosen for questioning southbound traffic and the Summer Street station for northbound. These two stations are located at practically the same point in the very center of the downtown shopping and business district. Observers worked at these two stations continuously from 7 a.m. to 11 p.m. on Thursday, Feb. 25, 1915.

On this work, no riding was done on the trains, but the passengers were questioned as to their ultimate destinations while they waited on the platforms for their trains. Practically all the passengers entering these stations were cash-fare ones—that is, they began their ride at this point. This was, of course, before the present Cambridge Subway extension was opened at Washington Street. The interval between trains was generally sufficient to permit the observers to approach and question a considerable number of waiting passengers. No attempt was made to question all the passengers, only a representative number being desired. The results showed that the observers succeeded in obtaining information from about 20 per cent. of all the people entering these particular stations throughout the day.

It did not seem feasible to give any advance publicity to the proposed traffic counts, and consequently the observers were obliged to rely on the printed slips and their own initiative for approaching passengers. In the subway stations slips were not used. Here in conspicuous places a large number of printed signs were hung announcing that a traffic count was being made and explaining in a few words what was wanted. The

signs were not placed until the day of the count. The observers in the stations recorded the data furnished by passengers on large blank sheets instead of on slips as used in the surface counts. Each observer wore a nickel-plated badge, bearing the title "Traffic Checker" and an identification number.

On the surface lines, 5720 cards were given out to passengers entering the cars, 5429 were collected, and 5168 were later found to contain satisfactory data. The latter figure represents 90.4 per cent. of the cards given out.

The office work of computing the length of ride of each individual and tabulating and analyzing the data is, of course, the expensive part of this kind of traffic count. The distance traveled by each individual had to be measured separately, but this work was greatly simplified and speeded up by the construction of straight-line charts representing the various surface-line routes. Each stop along the route was plotted to scale on the straight-line chart and was numbered according to a number system adopted for the field work. By the use of a scale marked off in miles, it was only a matter of reading the length of ride directly from the chart by placing the zero point of the scale at the passenger's origin and reading the distance to the destination. Connecting lines to which passengers transferred from the routes under observation were similarly laid out. Unusual transfer rides for which no charts were made were measured directly from a map of the railway system. For rides from the downtown subway stations tables were made showing the distances to all important localities, transfer points and terminals, and the ride of each individual had only to be measured on the map from the nearest of these tabulated points.

At the same time that the length of each individual ride was being computed, the number of times the passenger had to transfer to complete this ride was also determined (from a knowledge of the system) and all data entered in the upper part of the slip. In this work transfers to or from the rapid transit line terminals at Harvard Square, Sullivan Square, Dudley Street or Forest Hills were not counted, as the Boston system is so laid out that in general riders are practically obliged to make this transfer to reach the center of the city from the outlying districts.

Finally all data were assorted and tabulated so as to give, by lines, the numbers of passengers riding less than 0.5 mile, between 0.5 and 1 mile, between 1 mile and 1.05 miles and so on by half-mile groups up to the maximum ride. These results were calculated as percentages of total number of passengers questioned, and then plotted.

The data were also sorted out according to the number of transfers made by the passengers. Then the total passenger-mileage for those

making the transfers (ride on completed original car), those making one transfer, two transfers and three transfers were added up and tabulated. The average ride was computed for these different classes, with the result that on every line the length of ride showed an increase directly corresponding to the number of transfers. The accompanying table shows these results in some detail.

TABLE SHOWING INCREASE IN LENGTH OF RIDE WITH NUMBER OF FREE TRANSFERS USED

Route number	No transfers		One transfer		Two transfers		Three transfers		Total number of passengers counted
	No. of passengers	No. of passengers	No. of passengers	No. of passengers	Average ride, miles	Average ride, miles	Average ride, miles	Average ride, miles	
212	630	2.45	198	3.04	86	4.98	20	6.77	934
419	386	2.19	196	3.35	76	6.36	2	7.60	660
661	481	4.95	68	5.55	55	7.32	3	9.37	607
705	336	2.11	97	3.79	27	5.80	0	.....	460
762	614	5.20	275	6.67	22	9.03	4	10.30	915
907	482	4.21	195	4.34	69	5.87	9	10.03	755
Check count 907	528	3.92	227	4.46	63	5.57	19	10.15	837

Subsequent to the traffic survey just described, the Boston Elevated Railway transportation officials used this method to investigate the feasibility of a proposed revision of routes. The same form of slips and badges for observers were utilized by the experts of the Philadelphia Department of City Transit to determine the best routes for the new rapid transit subways.

Traffic Report Forms.—While the foregoing descriptions give a comprehensive idea of the methods used in making traffic reports, a few additional self-descriptive forms from other properties are included, namely: The field notebook of the Chicago Surface Lines; car tally slip, New York Railways; traffic report to superintendent of transportation, New York Railways; traffic checking slip, Milwaukee; traffic recapitulation, Milwaukee; traffic check summary, Milwaukee; traffic checker's form, Brooklyn; interurban traffic report, Aurora, Elgin and Chicago Electric Railway. (Figs. 27 to 34.) A typical punch card, designed for use on an electric tabulating machine and to which the data collected during an extensive traffic survey are transferred, is shown in Fig. 34A. A card of this kind is filled out for each passenger. This particular card was used in a survey made during 1916 by the Chicago Traction & Subway Commission.

Analysis of Traffic on Interurban Lines.—This presents a somewhat

Line _____							
At _____				Weather _____			
EAST		NORTH		WEST		SOUTH	
Run Number	Route	Time	Pass.	Run Number	Route	Time	Pass.
Checked by _____							
Remarks _____							

FIG. 27.—Notebook ruling for field data used by Chicago surface lines.

Bound _____		Slip No. _____			
_____		Div. _____			
Day _____		191 _____			
Tallied at _____					
Time	Run	Car	No. of Pass.	Headway	Sign
Name _____		Badge _____			
Address _____					

FIG. 28.—Car tally slip used by New York Railways.

NEW YORK RAILWAYS COMPANY
Office of Superintendent of Transportation.

Tally of _____ Cars _____ New York _____ day, _____ 191
Bound _____ at _____
Weather _____ Rail _____
Average seating capacity per car _____

Time	Cars	Seating capacity	Pass.	Excess or shortage of seat capacity per car		Cars required to give seats	Cars	Seating capacity	Pass.	Excess or shortage of seat capacity per car		Cars required to give seats
				Excess	Shortage					Excess	Shortage	

REMARKS

Copy to Gen'l Supt. of Transportation
Copy to Division General Foreman
Fig. 29.—New York Railways, form of traffic report submitted to Superintendent of Transportation.
----- Superintendent of Transportation -----

A further analysis according to hours showed three distinct traffic periods as follows: "A," 5 a.m. to 12.01 p.m.; "B," 12.01 p.m. to 6.01 p.m.; "C," 6.01 p.m. to midnight. The study of one line showed that after 6.01 p.m. the mileage was so large for the number of passengers carried that 150 miles a day could be eliminated, because 90 per cent. of the travel occurred between 6 a.m. and 7 p.m.

For the system as a whole, period "A" had 43.5, period "B," 36.8 and period "C," 19.7 per cent. of the traffic.

At this writing new forms of class registers are on trial which, if they meet the makers' hopes, will greatly simplify traffic checking on interurban railways. One of these registers or traffic recorders is described in detail in the chapter on "Fare Collection, Practices and Devices."

CHAPTER III

ACCELERATING TRAFFIC MOVEMENT ALONG THE LINE

The present chapter will discuss those means of accelerating traffic movement which are inherent to terminal and roadway conditions, while a following chapter will discuss the same subject from the standpoint of car operation. Some of these means lie within the scope of the railway's powers, but most of them depend chiefly on municipal and private co-operation.

The Rush Hour.—Any discussion on the acceleration of traffic movement may well be prefaced by a consideration of the most serious problem and handicap of the American electric railway, the rush hour. It is a popular belief that the morning and evening rush-hour periods are the most profitable of the day to the electric railway because of the volume of business done. Actually, a considerable part of this excess business has to be conducted with equipment which is needed only for this short period, so that the overhead charges on this equipment cannot be spread over the entire working day but over the 2 or 3 hr. of maximum travel only. The extra equipment thus required is not confined to the rolling stock only. It includes also the power station, distributing system, carhouses and practically every part of the physical equipment except the track. The same principle applies also to the car crews. Men who are competent to operate cars cannot be engaged to work only 2 or 3 hr. unless they are paid for a full day's work.

But these are not the only reasons for the higher cost per unit of service during the rush hours. Schedules are often disturbed, resulting in lost fares, extra payment for platform time, etc.

The energy consumption per car during the rush hours is greater because of the more frequent starts, slow-downs and stops. In fact, the motorman is obliged to run on resistance (energy-wasting) points for the greater part of the trip.

More collisions and platform accidents also occur per car during the rush hours, particularly the dark hours of winter mornings and evenings, than at other times. This is due to the many cars and other vehicles on the street and the larger proportion of less experienced trainmen. In

large cities the high storage cost of housing one car amounts to hundreds of dollars annually.

The average ride is longer during the rush hours than at other times because most of the passengers are riding from their business to the suburbs whereas much of the travel at other times is the shorter one of home to school, theater or store and the very short riding of agents and collectors. Again the cars return practically empty so that only one-half of the car-movement is revenue producing.

The fare loss is doubtless greater during the rush hours, for in every form of car yet devised some passengers will "get by." In side-entrance cars people may be observed slipping in via the exit aisles, and in the drop-platform cars a few will get in by way of the front platform but more will use the exit door at the rear. The conductor is too distracted at such times to catch all interlopers, and temporary blocking of the exit aisles is not feasible unless the load has already been discharged.

Doolittle's Study on Cost of Complying with Standards of Service.—

The most elaborate study of the cost of service during the different hours of the day will be found in Chap. XVI of F. W. Doolittle's excellent work on the "Cost of Urban Transportation Service" (published by the American Electric Railway Association, 1916). Mr. Doolittle uses what he terms a "concentration index" to show how service costs are affected by the number of car-hours per hour throughout the day. One of his tables shows a condition where 1 per cent. of the car-hours during a day are given in one hour or 4.16 per cent. of the time (24 hours), 2 per cent. of the car-hours in two hours or 8.33 per cent. of the time and so on until the final condition of 100 per cent. car-hours in 100 per cent. time is reached. The sum of the differences between the percentage of car-hours and the percentage of elapsed time is called the concentration index. Obviously, if the service requirements were spread more evenly over the whole time (24 hours) the differences between the percentage of car-hours and the corresponding percentage of car time would be less and the total of these differences—the concentration index—naturally would also be less.

Mr. Doolittle then explains and shows by an example how to determine the cost of operation of an electric railway during each hour of the day, as well as the effect of an increase in service in any period. In conclusion he says:

"The increased unit costs following increased service at the peak are found to be due to a number of conditions among which the most important are the following:

"(1) Operating expenses for platform labor are materially increased per car-hour run where additional service is furnished for short periods.

Under usual operating conditions, only a limited number of men can be secured for rush-hour service at the usual rates, in anticipation of advancement to full day runs. Additional inducements must be made, in order to secure labor for a few hours per day. The operating conditions of the company do not readily present other types of employment by which such labor can be employed during non-rush hours in order to constitute a full day's work.

"(2) Rush-hour service creates a peak on the generating plant and the cost per kw-hr. for electrical energy for cars is much increased during such peak periods. Investment in necessary generator and transmission capacity must lie idle during the greater portion of the day and in readiness for rush-hour service. The ordinary fixed charges upon such investment cannot be spread over the company's output, as would be the case if the service furnished had a demand uniform throughout the twenty-four hours.

"(3) The liability of accident during rush-hours is proportionately greater than during non-rush hours, due to the congested condition of the streets and the haste of passengers at these periods.

"(4) Investment in additional cars, car-housing facilities and car-handling facilities being idle during the non-rush hour period of the day, fixed charges upon such investment are accordingly higher per unit of service during the rush hours."

As an illustration of the number of cars in use at different hours, the Bay State Street Railway had on a typical day in 1916 nineteen or twenty cars producing revenue for only 1 hr., sixty-four in service 2 hr., seventy in use 3 hr., forty-five in use 4 hr., forty-one in use 5 hr., thirty-two in use 6 hr., and less than ten in use in all hours up to thirteen. Sixteen cars operated 13 hr. a day, eighty-four cars operated 17 hr., 162 cars operated 19 hr., and 108 cars ran 18 hr. daily. Forty-two ran 20 hr., four ran 22 hr. and one ran 23 hr.

Report of Committee on Cost of Rush-hour Service, 1916 Convention of American Electric Railway Transportation and Traffic Association.—This committee set out to prove the following proposition: "It is the relation of income to expenditure between the hours of 9 a.m. and 4 p.m. that is the most favorable to the company. Therefore, if capital is to be encouraged in further investments undue burdens must not be placed on the company in the nature of added rush-hour costs. This applies equally to the shortsighted policy of requiring reduced fares, such as workmen's tickets, during the hours of heavy travel."

The detailed information supplied by one member company for this committee's report is here presented, covering a city of less than 500,000 population.

It will be noted that this study applies to cash passengers only, and the contrast between the cost per car-hour and the cost per fare on 1-, 2- and 3-hour cars and those operating 18 hours is too evident to warrant comment, notwithstanding the fact that 13.19 per cent. of the fares were collected during the busiest evening hour.

Hours in service	Cost per car-hour	Number of fares per hour	Cost per fare, cents	Number of fares per hour	Cost per fare, cents
1.....	\$7.54	81	9.31	Note	Note
2.....	4.85	72	6.74	....	....
3.....	3.96	71	5.58	....	....
4.....	3.51	76	4.62	....	....
5.....	3.24	69	4.70	....	....
6.....	3.06	66	4.64	....	....
7.....	2.93	57	5.14	....	....
8.....	2.84	57	4.98	....	....
9.....	2.76	57	4.84	....	....
10.....	2.70	57	4.74	....	....
11.....	2.64	52	5.08	57	4.63
12.....	2.61	50	5.22	58	4.50
13.....	2.58	57	4.53	....	....
14.....	2.55	57	4.47	....	....
15.....	2.52	57	4.42	....	....
16.....	2.50	57	4.39	....	....
17.....	2.48	57	4.35	....	....
18.....	2.46	57	4.32	....	....
19.....	2.45	56	4.38	....	....
20.....	2.43	54	4.50	....	....
21.....	2.42	52	4.65	....	....
22.....	2.41	....	....	50	4.82
23.....	2.40	....	....	....	....
24.....	2.39	....	....	49	4.88

NOTE.—Items in this column derived by combining eleven-hour runs to make twenty-two hour runs and twelve-hour runs to make twenty-four hour runs.

Average cost per fare passenger 4.70 cents.

Average fare per fare passenger 4.25 cents.

Cost includes 7 per cent. return.

The following explanation was given with these figures:

In order to obtain data on which to base our computations we drew up a typical week-day service diagram and from this determined the percentage of the total number of car-hours during the day, made in each of the twenty-four hours. These percentages were then applied to one-third hundred and sixty-fifth of the total car-hours run in 1915. This gave a constructive service diagram which represents in a general way the normal service on our lines taking into account all service rendered during the year. The only alternative to this method of procedure was to attempt to separate operating expenses into those properly chargeable to operation on week days as distinct from the cost of operation on holidays and Sundays. Such a separation imposed difficulties too great to be attempted in the time available.

The apportionment of operating expenses and of fixed charges as between those varying with the car-hour and those dependent upon the maximum number of cars in

service showed that about 34 per cent. of the fixed charges and about 10 per cent. of the operating expenses depended upon the maximum number of cars in service.

Hour	Per cent. car-hours		Per cent. fares	
	A.M.	P.M.	A.M.	P.M.
12:00- 1:00	2.45	3.79	0.53	4.37
1:00- 2:00	1.39	3.81	0.27	4.63
2:00- 3:00	0.24	3.83	0.18	4.36
3:00- 4:00	0.22	4.16	0.17	4.08
4:00- 5:00	0.22	6.70	0.17	5.88
5:00- 6:00	5.33	9.20	0.53	13.19
6:00- 7:00	7.19	9.16	11.72	10.75
7:00- 8:00	7.58	4.75	9.21	5.12
8:00- 9:00	6.87	3.88	4.58	3.44
9:00-10:00	3.79	3.01	2.75	2.75
10:00-11:00	3.03	2.92	2.86	2.78
11:00-12:00	3.58	2.90	3.38	2.30

It was also contended by that company that the application of the method suggested by the committee results in a showing of the cost of rush-hour service below that actually incurred by operating companies.

Problem of Ameliorating Rush-hour Conditions.—While the rush-hour problem will always remain a serious one with electric railway companies, suggestions for its reduction have been made as follows: More variation in the opening and closing hours of large establishments; better loading conditions at terminals or elsewhere; quick-entrance cars; train, trailer or double-deck operation; quicker acceleration and braking; finally, acceleration of the service after the car has left the loading zone.

Handling Travel at Large Factories.—Although the matter of greater variation in factory closing hours has been discussed for more than a decade, little progress in this direction has been made other than in arranging for quick-loading facilities. It is true that some factories work their departments together in such fashion that all must begin and end at the same time. Yet in far many more the uniform hours are purely a matter of custom. Again, would the big department stores really suffer if they agreed to close say 30 min. before the peak of the evening rush?

The Ford Motor Company is one of the few large manufacturers which has shown a little human sympathy for its local railway. The

Detroit United Railway sells seven tickets for 25 cts. throughout the city of Detroit, and to avoid the need of making change on the cars a ticket booth has been provided within the grounds of the Ford factory near the exit, the tickets being sold to the employees as they leave. The Ford Motor Company has posted notices in the plant requesting employees to purchase tickets before boarding the cars. The traction company reports a great improvement in maintaining schedules since the introduction of this scheme. The Ford company releases its employees at 3 p.m., 4.30 p.m. and 5.40 p.m. The railway stores thirty-three cars for the 3 o'clock rush, and twenty-five and sixteen cars respectively for the other two. In addition, two other lines near the plant are available for Ford employees. The tickets sold at the booth are not reduced in price, the sales being effected solely through the desire of the Ford company and its employees to co-operate with the railway.

Another difficult case exists at the Schenectady works of the General Electric Company, with its large number of shopworkers, business and technical staff. A trolley terminal is located at the main entrance gate. It consists of a single-track loop of about 100-ft. radius where the different lines terminate. Passengers are loaded and discharged around this loop, as well as on the main line during rush hours. Shunting from this loop and parallel with the main track is a 500-ft. siding where cars can be loaded or unloaded without interfering with the regular operation on the main tracks. The terminal is simply a continuation of this double track at the side of the public highway which runs adjacent to and parallel with the company's plant for about $\frac{1}{2}$ mile and includes a crossover for terminal purposes only. The express car service given by the Schenectady Railway for the General Electric Company's employees is described later in this chapter.

At Rochester, N. Y., the employees of the Eastman Kodak Company are dispatched rapidly by means of a special station and loading loop. Fare is dropped into boxes at the station, but transfers are handed to the passengers by the conductors as they board the cars. At this plant the girls are released 5 min. before the men, so that they get cars largely to themselves. Between 5.25 and 5.45 p.m., 800 passengers were handled in twenty cars on a typical day in the winter of 1915. The New York State Railways, Rochester Lines, also makes it a point to keep the Eastman Company apprised of all traffic delays. This avoids friction with employees and permits better provision for emergencies.

At Kansas City, Mo., the 2500 employees of Montgomery, Ward & Company are released in three sections at 5.10, 5.15 and 5.20 p.m.

Buildings for Loading Terminals of City Cars.—The preceding paragraphs relative to co-operation with big factories point out that the

congestion of the line may be appreciably reduced even by the simple expedient of having the exact fare ready in advance or, still better, paying at a station booth before entering the car. But surface street railway conditions in several of our cities have already brought with them the need for facilities at the center of maximum loading. Thus the Public Service Railway constructed during the year 1910 a trolley car terminal for its Hoboken lines and on April 30, 1916 it completed a far more elaborate terminal with subway and elevated connections, at Newark, including in this case, a large office building. Relief measures such as policing of regular traffic, turning of cars on certain lines and electric semaphores for car loading had been adopted but did not solve the problem.

Among other terminals for street cars are those of the British Columbia Electric Railway at Vancouver, B. C., and of the Oklahoma Railway at Oklahoma City. Both serve as city and interurban terminals and have been used since 1911. The latter is in the form of a terminal arcade with a train shed and the plot for it, in the heart of the business district, was bought in the early days of Oklahoma's land booms. The train shed is also the headquarters of the dispatcher. When the passenger pays his fare at a turnstile he receives a check which entitles him to board any car within the station inclosure.

The greatest advantages of such terminals are the quickest possible handling of passengers and cars and the positive collection of all fares under the most strenuous conditions. These benefits may be found on study to justify the erection of a terminal and the re-location of tracks in what is naturally the most expensive part of the city.

Front-end Street Fare Collectors or Ticket Booths at Heavy-loading Points.—In many cities it would not pay to build a terminal in any event because the loading area extends over too great a territory to justify walking to the terminal. Again, the loading points may be certain corners preferred by habit rather than reason, as at Pittsburgh. In such situations the front-end collection scheme introduced by the Metropolitan Street Railway, Kansas City, Mo., about 1911 commends itself as a helpful accelerator of traffic movement.

Front-end Collection at Kansas City.—By 1915, the Kansas City company was employing thirty-six men as auxiliary front-end collectors for the evening rush which lasts from 3 to 6.30 o'clock, and six men in the morning. The collectors are placed at busy transfer points, at department stores, and also in the packing-house district. They are also employed at ball grounds in the summer and at theaters in the winter. The collectors stand on the ground opposite the front platform of each car as it comes to a stop. Each one is provided with a transfer pad and a register carried on a cord from his shoulders. Each one keeps

a trip sheet exactly as do the regular conductors. In one test the loading time was found to be 1.07 sec. per passenger, about 40 per cent. of the passengers using the front door. Under similar conditions with rear-end entrance and collection only the loading time was found to be 2.23 sec. While the public did not take kindly to the innovation at first, this sentiment was quickly overcome as soon as the results in faster schedule speed became apparent.

In January, 1915, this company built a booth at the corner curb-line for the use of passengers to and from the new union station. General agents of the company, as they are called, occupy this booth from the first regular car in the morning until midnight, chiefly to answer questions as to destinations and routes, and to look after the running of the cars. Incidentally, tickets are sold at 5 cts. each—no reduction for quantities—at the booth. There was some doubt as to how extensively the opportunity to buy single-ride tickets would be used, but the feature has proved very popular. Half-fare tickets are also sold at the booth. Heretofore the full-fare tickets have been purchased at the company's offices, chiefly by firms which provide their employees with transportation.

Front-end Collection at San Francisco.—In 1912 the United Railroads of San Francisco introduced front-end fare collection at a few points where the presence of large numbers of passengers desiring to board cars in the heat of the business district complicates the handling of rush-hour traffic. Here a record of the front-end conductor's work is kept on a portable register, tickets being registered the same as cash. The trip sheet of the front-end conductor does not show the number of fares collected for any individual car, or for any particular line, but shows the collections made for the entire period. Receipts are credited to the several lines in a proportion determined by the accounting department from the morning rush-hour receipts of each line.

The ten to twenty front-end conductors are recruited from the best men of the various divisions and in some cases are used at terminals to the extent that they work a full day. In other cases where employed only for an hour or so morning and evening they are given any special work that may occur in the remainder of the day. They are used in place of regular men who want to get off but who do not care to lose an entire day, and consequently do the morning and evening work. In other cases regular conductors, after completing a day's work on their own runs ask to be assigned to this work during the evening. Front-end collectors are employed only in evening service between 4.45 and 6.15 o'clock. However, during the Panama-Pacific Exposition the San Francisco Municipal Railway had auxiliary collectors at the Fair Ground tracks during the day.

Where front-end conductors are at work, all passengers desiring to

leave the cars by the front exit are permitted to do so before any passengers board the car. The front-exit door is of the standard small size and, when at work, the conductor stands on the ground at its forward side collecting and issuing transfers as the intending passengers are ready to step upon the car. When the conductor is collecting for one line only he issues the transfers at that line, but in cases where he is collecting for many lines, he issues a special conductor's transfer good for all outbound cars. The front-end conductor also assists materially in the moving of cars by signalling the motorman to proceed after having collected the fares and having seen that the rear end is clear. Sometimes the front-end conductor collects fares and issues a transfer before an approaching car has come to a stop; however, this practice has not developed to any great extent. In large crowds the conductor stations himself firmly against the car at the forward side of the exit gate so that only one passenger can pass at a time and little or no difficulty has been experienced in preventing people from slipping past the conductor. During periods of great congestion traffic officers are present to prevent jams and to regulate the crowd. This has been done frequently and with such success that many times the people voluntarily form a line in front of the door.

The result of loading by front-end conductors is an advantage in time both to the patron and to the company; passengers are permitted to enter the front end where the car is the least crowded; the congestion on the rear end is greatly reduced, and the load is more evenly distributed throughout the entire car. In short, it fills the forward section of the car, that part which the conductor on the rear end has so much difficulty in trying to persuade passengers to occupy. Stated in traffic terms, cars carrying sixty-five passengers can be moved on a 15-sec. headway.

Objections to Front-end Fare Collection.—So far as can be judged, the one traffic objection urged against auxiliary fare collectors is where other vehicular traffic is so heavy that the car movement cannot be speeded up. It is contended that if cars must wait by the order of a traffic officer, there is no advantage in being ready a few seconds earlier. Nevertheless, the sooner passengers can get from the street into the car, the better for their safety and comfort, even though no time is saved. The financial objection is that it is difficult to check the individual-car receipts.

Megaphones to Speed Traffic at Loading Points.—About two years ago the Boston Elevated Railway adopted megaphones for announcements to waiting passengers. The utility of the megaphone is so obvious that it ought to have been a fixture in electric-railway service long ago. A terminal or loop is generally a pretty noisy place where the voice of anyone but that of the famous Stentor would be lost. The

most desirable method would be to display signs indicating the destination of the car next approaching, but where this is not practicable megaphone announcements would prevent confusion and insure a better distribution of passengers.

Automatic Train Announcers to Speed Terminal Traffic.—Where many routes run from a terminal or joint station, it is desirable to have automatic train announcers so that passengers can find the proper tracks and trains without error. The Hudson Tunnels of New York and the Boston Elevated Railway use illuminated box signs, while the routes of the elevated lines which enter the New York terminal of the Brooklyn Bridge are indicated by annunciators and hand-operated semaphores. In 1912 the Public Service Railway installed at Broad and Market Streets, Newark, N. J., electrically operated semaphores on five successive poles to indicate the approach of cars of indicated routes. The name of the route appeared on both sides of each semaphore, and reflectors were placed above the semaphore for easy reading during the winter rush hours.

A more comprehensive system than any of these is the electrically operated remote control scheme installed on a number of the European railways, particularly in Germany, to indicate to the passengers the character and destination of the incoming and outgoing trains.

These signs are usually hung over the proper track. The words "Direction" and "Trains" are painted on the body of the signs, but the destinations are painted on metal sheets which drop from a container, as manipulated. Initial letters painted on the container indicate the character of train, as "L" for local, "X" for express, "S" for special fare. These indications are covered by drop shields and the sign operator exposes only that which relates to the next train.

CAR SPEED AND TRAFFIC REGULATION

Schedule Speeds in City Service.—The average schedule speed of electric railway cars in American cities may be said to exceed that in European cities by about 25 per cent. This higher speed is due more to better equipment than to any other cause. In fact, if the American car was not handicapped by the shorter distance between stops, as explained later, it might double the European speeds.

The Board of Supervising Engineers estimated for Chicago conditions that an increase of 1 m.p.h. in *schedule speed* would allow passengers to live $\frac{1}{2}$ mile further away from business, assuming 30 min. as the maximum time allowable for surface transit in competition with elevated lines.

The following table from R. M. Feustel's report on Winnipeg shows the schedule non-rush-hour speeds during the year 1913 in twelve North American cities:

TABLE SHOWING COMPARATIVE SCHEDULE SPEED IN MILES PER HOUR DURING NON-RUSH-HOUR PERIOD FOR DIFFERENT SYSTEMS

	Speed in m.p.h.	Population
Cleveland.....	10.50	561,000
Indianapolis.....	9.80	234,000
Columbus.....	9.50	182,000
Detroit.....	9.50	466,000
Omaha.....	9.50	125,000
St. Louis.....	9.40	688,000
Minneapolis.....	9.38	302,000
Milwaukee.....	9.07	374,000
Kansas City.....	9.00	249,000
Cincinnati.....	8.36	365,000
Winnipeg.....	8.35	175,000
Newark ¹	8.35	348,000

No fixed relation between town size and car speed appears from this table.

In connection with the figures the following facts are pertinent: In an investigation of traffic conditions for the city of Winnipeg it was found that the average speed during the non-rush hours could be raised safely from 8.35 to 9.5 m.p.h. The low speed in Newark is due partly to congestion in the lower part of the city, to grades and an excessive number of stops. The low speed in Cincinnati is due chiefly to grades. The high speed in Cleveland followed the abolition of a speed-limiting ordinance in 1913. In that city the platform men in trying to secure better working hours urged the repeal of an ordinance which had limited the running speed (not schedule speed) to 10 m.p.h. in the business district and 15 m.p.h. in the residential district. After this change was made the motormen attained the high schedule speed of 10.50 m.p.h.

In general, the average schedule speed throughout the United States and Canada is 9 to 10 m.p.h. It should be understood that this applies only to normal hours since the schedule speed during rush hours generally is less and during owl hours more than the figures given.

Traffic Signals.—The following paragraphs summarize several of the systems used for traffic control by means of signals manipulated by traffic officers:

The simplest system, of course, is that which requires no apparatus. This is good enough for some situations but it will generally be found desirable to have signals which are audible or visible as far as the next intersections on each side of the traffic-control point.

At St. Louis the traffic officer's signal in 1915 was as follows: Both arms extended give traffic the right of way in either direction and stops

¹ This speed includes layovers; actual trip speed between terminals is 8.88 m.p.h. This figure does not appear in Mr. Feustel's original table. On the Public Service Railway city and suburban lines as a whole, but excluding the high speed lines, the schedule speed in November, 1916, was 9.3 m.p.h.

all cross traffic. One arm extended gives traffic from the direction indicated the right of way and also allows cross traffic on one side of the street. A third signal is given for rounding corners. All signals apply to cars as well as to self-propelled or drawn vehicles.

At Columbus, Ohio, traffic officers give one blast of a whistle to denote that cars running east and west may proceed in their respective directions and that cars running north and south are to remain at a standstill. Two blasts from a whistle permit motormen operating cars north or south to proceed. Three blasts from an officer's whistle mean that all cars are to remain at a standstill, as an indication that a vehicle which has the right of way is coming.

At Chestnut and Broad Streets, Philadelphia, the department of public safety installed semaphore signals in 1913. These are placed in the middle of the street in charge of the traffic policeman. One arm is marked "stop" and the other "closed" and vehicles are prohibited from passing when either is raised to a horizontal position. Such semaphore signals can be descried at a greater distance than the arm movements of policemen.

In Cleveland an electric traffic signal was installed during 1914 at one of the busy intersections. The signal consists of four pairs of red and green lamps mounted on the tubular steel trolley poles, controlled from a police booth placed on the sidewalk at one corner. In addition to the control switches for the signals, the booth also contains connections with the police and fire alarm circuits so that the street may be cleared for the rapidly moving emergency vehicles. Bell signals ring and red lamps appear in such emergencies.

On Fifth Avenue in New York semaphores with four arms at right angles, revolved with a handle by the traffic officer are used. Two opposite arms are painted green and bear the word "go," while the other two arms are painted red and have the word "stop" painted on them. By revolving these arms a quarter turn the officer can control the traffic on intersecting streets.

A semaphore for directing street traffic in use in San Francisco is arranged for electrical control from the traffic officer's stand. The San Francisco device consists of a double-pointed arrow which bears the word "stop" on either face and can be turned through 90 deg. by a 110-volt motor mounted in a metal box just above. The motor also operates a police whistle which sounds two blasts as the arrow is turned one way and a single blast when it is returned to the opposite position. When the crossing is to be cleared for the fire department, the arrow is made to revolve continuously and the whistle blows until shut off. At night the arrow is lighted by two 40-watt tungsten lamps, and a third lamp, located in the red globe below the arrow, is automatically put on the circuit when the alarm signal is given.

The switch box operated by the traffic officer has five controls; two govern the position of the arrow, a third operates the lights, a fourth controls the alarm signal and a fifth raises or lowers shutters to conceal the lettering on the arrow during the night hours when the semaphore is not in use. The arrow is hung to be about 2 ft. below the trolley wires. The arrow in the later semaphores is 51 in. from tip to tip.

In another and later street traffic signal installed in San Francisco, green and red lights on a standard are used to indicate whether north and south or east and west travel is permitted. The whistle feature is retained, the air being supplied by a small motor and rotary pump. The traffic officer operates the whole apparatus by means of a treadle.

Co-operation with the Police and Fire Departments.—Whether traffic ordinances are good or bad their value to the public and the railway will depend very largely on their interpretation and enforcement by the police department. Every effort, therefore, should be made to enlist its co-operation. A good traffic officer can do more to keep the road clear than the most rigid ordinance for he can issue a summons to any vehicle operator who is blockading the thoroughfare.

The fire department should also be asked to refrain from placing hose across the tracks, especially since a blockade at one point may hinder the work of the fire department at a half dozen other places.

Car Speed Should Equal that of Automobile.—In his report on Providence traffic conditions, made in 1911, B. J. Arnold said that through a combination of ordinances limiting the maximum running speed of cars and the restrictions caused by traffic obstructions, the average schedule speed in the city and its immediate suburbs was only 7.97 miles per hour, when measured from terminus to terminus, and only 8.71 miles per hour with the congested districts excluded. He pointed out that automobiles and other vehicles are permitted to operate through the city at 15 miles per hour and recommended that cars be permitted at least the same latitude of running speed as vehicles not operated upon a fixed track.

Indeed, it seems strange, that a vehicle which is confined to a pair of rails, in charge of a carefully trained man and fitted with air brakes and fenders should be more restricted as to speed than a runamuck automobile with anyone for a driver.

Every operator knows that higher schedule speed means that more car service can be given with the existing number of cars, and that this, in turn, means lower maintenance and platform costs per mile operated. He should impress upon the public that higher schedule speed means more seats past a given point from the same number of cars as well as a saving in time of transit, and that a high schedule speed does not necessarily mean a high maximum speed.

How can Schedule Speeds be Increased Safely?—The following are some of the means which may be available for increasing schedule speeds without increasing maximum speeds. Improved loading conditions as described in the following chapter; decreasing delays due to vehicular traffic; longer distances between stops; smaller number of stops for certain classes of cars; time-point operation.

Reduction of Team and Auto Congestion.—Of the foregoing means for increasing schedule speed, reduction of team and auto congestion is

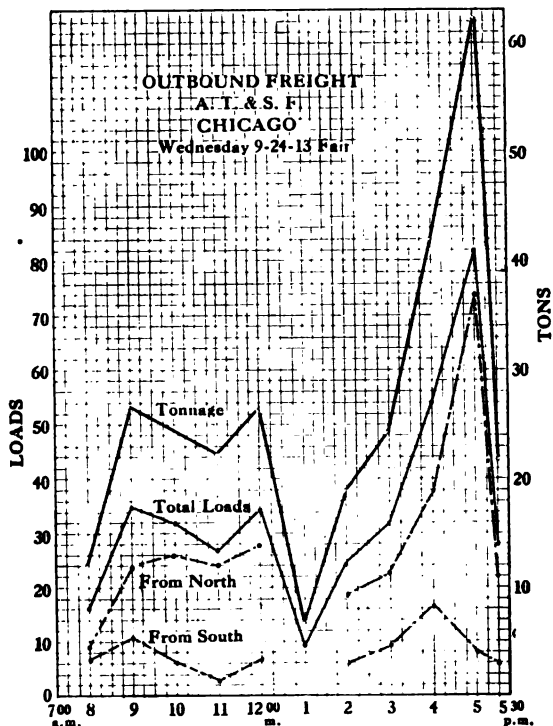


FIG. 35.—A Chicago record by B. J. Arnold of freight vehicle congestion at a downtown freight house.

by far the most important source of relief. As the car is neither self-propelled nor free to go around obstructions it must be helped from without. Until recently the motorman had no redress but to clang his gong until he was footsore. To-day, happily, legislators have begun to appreciate the conditions, while the teamsters and chauffeurs have also been brought to a more reasonable frame of mind.

The fifth annual report of the Board of Supervising Engineers in referring to team congestion showed that in Chicago such congestion was particularly bad at the rush hour. One chart presented the team traffic to a typical downtown freight house. The 5 o'clock peak here

was practically coincident with the street-car peak. This chart, which is reproduced in Fig. 35, illustrates one of the most prolific causes of car delays on surface lines in Chicago, inasmuch as most of the freight stations in that city are on important arteries needed for passenger travel.

The blockading effect of other vehicles may be shown not only by figures and graphs but by pictures which are simpler and more convincing to the layman. Because of blockades suffered in the older, narrow streets of New Orleans the New Orleans Railway & Light Company began in 1912 to pay for photographs of blockading wagons and to keep therewith full data of the attendant circumstances. In the winter of 1914 the Third Avenue Railway System, New York, made a similar offer to show, in this instance, the preference that teamsters display for the tracks when the city has failed to clear the remaining space of snow.

Ordinances Regulating Vehicular Traffic.—The first feature of every ordinance regulating vehicular traffic should be one which will keep self-propelled and horse-drawn vehicles away from congested tracks in narrow streets. In broad streets such vehicles should be confined to the space between the rails and the curb, and for narrow streets it would be desirable to specify one-way traffic only. For especially congested streets or portions of the street it might be desirable to prohibit all vehicular traffic at certain hours of the day.

Among the early regulations of the latter character is that which prohibits vehicles to use the Brooklyn Bridge during the rush hours as they would interfere too seriously with trolley-car operation.

Late in 1914 the transportation committee of the Chicago City Council was asked to prepare an ordinance which would prohibit wagons under penalty of a fine from using the tracks during the rush hours. In support of this measure the Chicago surface lines showed that during the first ten days of December, 1914, 100 wagon breakdowns occurred on the railway tracks in the business district alone. Each breakdown caused the car behind an average delay of 10 min. and gradually decreasing time losses to say ten following cars. It was even suggested that all vehicles which transport package freight and similar material be kept out of the loop district during the rush hours. In 1912 the transportation committee of the city council had advocated a similar measure, and demanded that the space between the rails and curb be kept free from building materials except at night.

In September, 1914, the Borough of Brooklyn, New York, announced that on its most important thoroughfare, Fulton Street, vehicles would be permitted to cross from one side to the other only at regular intersections.

In 1915 the Detroit City Council passed an ordinance which permits the driver of a vehicle to pass between the running board or lower step of a car headed in the same direction, when stopping to discharge or take

on passengers, only if there is a 6-ft. clearance between the car step and the vehicle. If it is not possible to allow this clearance the vehicle must stop at least 6 ft. from the rear end of the car.

In New Jersey an 8-ft. clearance between the automobile and a standing trolley car is required if the automobile passes between the trolley car and the curb to the right-hand side of the car or that to which passengers will be apt to pass. In fact, the tendency of the times is toward the more strict regulation of vehicular traffic for the benefit of pedestrians and electric railway passengers.

General Regulation with Aid of Safety Zones and Signals.—The latest developments in traffic regulation by municipalities are the provision of safety zones and traffic control by means of signals. Safety zones are intended particularly for the pedestrian or for the car passenger who is boarding or alighting. However, by keeping other vehicles out of the charmed circle, the electric railway secures greater freedom of movement.

The zones are generally made by setting up metal standards which are connected by chains or ropes. The standards usually carry a red disk with the words "Safety Zones." It is desirable also that distinctive lighting be used at night. In some cases, particularly on asphalted streets, borders are drawn in white or colored paint.

This plan has now been adopted so extensively that the different ways rather than the places need be named. These reservations must not be crossed or be occupied by any vehicles except fire and police. The safety zone is applied also to heavy traffic loops or intersections where permission to cross the tracks would endanger waiting passengers and impede cars.

Crossing safety zones in New York are marked by white paint on the pavement and are essentially extensions of the sidewalk lines. They mark the path to be taken by pedestrians in crossing the street, and serve as warnings to drivers and motormen as to the exact line where the pavement intersection begins, where pedestrians are likely to be found, and outside of which vehicles and cars must stop while pedestrians are crossing. The zones are also expected to encourage square turning of corners by vehicles.

Safety Street Platforms.—For very wide streets, the concrete safety platform, such as is used in San Francisco, Los Angeles and Newark, N. J., makes a very desirable improvement. Market Street, San Francisco, where these platforms were first installed, is 70 ft. wide. In theory these platforms are a modification of the raised "safety isle," familiar to visitors to Paris, and are intended to protect passengers intending to board cars from reckless automobilists who will drive heedlessly through chalk-marked or painted safety zones on the streets. These platforms are from

2½ ft. to 3 ft. from the tracks, from 4 ft. to 6 ft. wide, from 6 in. to 8 in. high, and of various lengths. Those in San Francisco, are from 25 ft. to 70 ft. in length, and are protected at the ends by a concrete bulwark or barrier. The platforms in Los Angeles are much more recent, having been installed during 1915, and are about fifty in number.

The Newark platforms are on Broad Street, the widest thoroughfare in the city and were also installed in 1915. One is shown in Fig. 35A.



FIG. 35A.—Safety platform at Newark.

Educating the Teamster and Chauffeur.—The “Safety First” movement has been of great advantage to railways in persuading the operators of other vehicles to leave the track with the first stroke of the motorman’s gong; also to give more attention to traffic ordinances in general. Some railways have sought this co-operation through correspondence with the vehicle owners, especially at times of special danger or difficulty, as with slippery leaf-covered tracks in autumn and snow in winter. A more diplomatic and effective method, however, is to go directly to the men themselves.

The Public Service Railway of New Jersey submitted at personal interviews placards requesting co-operation on the part of teamsters and then furnished these placards free of charge to all owners of trucks in the cities through which the company’s lines extend. After the cards had been posted the effort was followed up with talks before the truck drivers’ social organizations and before meetings of the teamsters’ unions.

In addresses directed to the teamsters generally, the attitude of the hearers was at first derisive, but later when the object of the talk was fully disclosed, this changed completely. In the use of the pamphlet and in the talks the idea is to avoid exerting actual pressure upon the teamsters but to appeal to them to recognize the matter as being of mutual benefit to themselves, to the motorman (a traditional enemy!) and to the passengers. On the posted placard no mention is made of the Public Service Railway, the card bearing only the signature of the owner of the stable or garage in which it is posted. A noticeable decrease in accidents was reported for the following year (1914).

The Northern Ohio Traction & Light Company during 1913 sent out letters asking for the co-operation of truck drivers in keeping the tracks clear. These are reported to have been well received and to have produced noticeably good results. The scheme has been followed up by letters sent to the actual offenders as they are found from time to time.

In Rochester, the New York State Railways have also made efforts along these lines, having published an advertisement in the local official trades union paper which showed, for each month of the previous year, the duration of interruption to service caused by stalled or brokendown wagons, automobiles or trucks. The advertisement appealed for co-operation and asked the teamsters not to drive on the tracks except when absolutely necessary. The text of a typical advertisement of this kind appears on page 272. To secure a feeling of mutual good will the motormen were advised by bulletin to consider that pulling clear of the track was an act of kindness rather than duty on the part of the teamster.

The Beaver Valley Traction Company, New Brighton, Pa., has given to all the horse drivers in town the most appropriate gift of safety pins of the kind used for horse blankets. It might be well for other railways to present such constant reminders. In the long run it is the friendly attitude of the vehicle operator rather than of the vehicle owner that is most important to keep the road clear.

Some excellent posters to educate drivers to avoid collisions with electric cars have also been issued by the National Safety Council, which has a number of electric railway companies among its members.

SPEEDS AND STOPS

The Economy of Higher Speeds.—Before discussing the relation between speed and stop intervals, it will be well to quote from a general calculation on the economy of higher speeds by B. F. Wood when vice-president of the United Gas & Electric Engineering Corporation, New York. Mr. Wood found, using the United States electric railway

census figures as a basis, that each decrease of 10 per cent. in the running time will permit an increase in service of some 7 per cent. without an increase in the cost of operation. Faster schedules may be obtained in two ways:

1. Increasing the maximum speed; and,
2. Reducing the number of stops.

Manifestly, the former method brings with it the possibility of increased accidents as well as of interference with legal restrictions. For this reason, it is not considered in this analysis, which deals only with decreases in schedule time that may be obtained either by reducing delays or by cutting out stops, and all of the deductions herein submitted are predicated upon the existence of an absolute maximum running speed.

Such a situation as this, for example, might exist in connection with the introduction of a skip-stop scheme, whereby enough stops might be cut out to shorten the running time, say, 10 per cent. For a given schedule, the number of cars required would vary in proportion to the change in schedule time. Of course, conditions might be conceived where the rush hour was of such a short duration that an appreciable number of the trippers would make but one trip per day, and under such circumstances the number of cars would not vary exactly in proportion to the schedule time. However, a close approximation of direct proportion would obtain in any event so that the relation may be generally applied.

Since most of the electric railways of the country have their operating expenses distributed as shown by the figures of the electric railway census for 1912, it may be said that a number of the items which go to make up the total expense would be directly affected by a reduction in running time, and these are shown in Table I. This table shows, in the first column, the amounts chargeable to the various accounts included under operating expenses, these amounts being expressed in percentages of the total operating expenses. In the adjoining column are transferred the percentages representing those accounts which are affected by an increase in speed, which total 54.4 per cent. Expressed otherwise, each \$100 of operating expenses includes \$54.40 that will be affected by faster schedules, and if schedules are reduced 10 per cent. there will be a reduction of 10 per cent. in the affected accounts, this reduction amounting to \$5.44, and this would pay for practically 6 per cent. more service. There are, as a matter of fact, other incidental savings which do not appear in the table, but these will be taken up later.

An explanation of the reasons for the selection of the affected accounts that are shown in the second column of Table I is, perhaps, necessary. First in the list is the general heading covering way and structures. It is obvious that none of the expenses involved here would be influenced

by changes in the speed or in the number of cars, provided the changes were within reason. A possible exception may be made in connection with the items applying to buildings, but this will be discussed later. Therefore no entry from this account appears in the list of items affected by schedule speed.

With regard to the charges under the general head of equipment, however, it may be said that material changes should take place if the schedule time of the cars is decreased. The charge for superintendence of equipment, perhaps, would not be affected except upon a property of the largest size, but the charge for maintenance of cars should vary exactly in proportion to the running time. The reason is that, as the speed increases, a greater daily or yearly mileage is obtained from each car, and proportionately fewer cars are needed to do a given amount of work. Maintenance of cars will, in the end, vary as the car-years rather than as the car-miles. Indeed, there is ample experience to show that within a reasonable variation in mileage the cost of maintaining a car will average very close to a fixed sum per car per annum, so that a car making a large annual mileage will cost less per mile for repairs than one making a small mileage per annum. Based upon the census figures, then, the entire charge for maintenance of cars, amounting to 5.1 per cent. of the total operating expense, will be affected by a change in speed, and this percentage has been entered in the column of affected accounts shown at the right in Table I.

With regard to the charge for maintenance of the electric equipment on the cars, it should be said that an increase of schedule speed obtained by a reduction in the number of stops involves no increase in the work done by the car motors. Paradoxical as it may seem, a faster schedule will result in a lower energy consumption per car-mile, always considering, of course, that the higher speed comes only by the cutting out of stops. Briefly to cite an example; a car on an 8-m.p.h. schedule with twelve stops per mile, requires about 150 watt-hr. per ton-mile. If the same car is operated without any stops, the scheduled time will be reduced approximately 40 per cent., and the energy consumption will be decreased somewhat more than in direct proportion, or to less than 90 watt-hr. per ton-mile.

If, when the schedule time is reduced by a given percentage, the energy consumption per car-mile is reduced by a still greater percentage, it follows that the work done by each motor in a given time is actually reduced. The maintenance of the electrical equipment should therefore be somewhat reduced because of the less work done. But in practice maintenance costs vary rather with the number of motors in service than with minor changes in the amount of work. Therefore the total charge under this account will be reduced at least in proportion to the

number of motors at work, the cost per motor remaining about the same. This whole account, therefore, may be said to vary in proportion to the running time and is so entered in Table I.

TABLE I.—DISTRIBUTION OF OPERATING EXPENSES FOR AVERAGE RAILWAY SHOWING ACCOUNTS AFFECTED BY INCREASED SPEED

Account	Percentage of total operating expenses	Percentage affected by higher speed
Way and structures.....	13.9	...
Equipment:		
Superintendent of equipment.....	0.5	...
Maintenance of cars.....	5.1	5.1
Maintenance of electrical equipment...	3.0	3.0
Miscellaneous.....	0.9	0.6
Depreciation of equipment.....	1.1	1.1
Other operations.....	0.3	0.2
Maintenance of power equipment....	1.1	...
Traffic expenses.....	0.8	...
Power:		
Power plant employees.....	1.9	...
Substation employees.....	0.6	...
Fuel for power.....	6.1	6.1
Other power supplies.....	0.6	0.4
Power purchased.....	7.4	7.4
Other operations.....	1.6	...
Conducting transportation:		
Superintendence of transportation....	2.1	...
Conductors, motormen and trainmen..	29.5	29.5
Miscellaneous transportation expenses.	7.2	...
General and miscellaneous:		
General.....	5.7	...
Injuries and damages.....	6.2	...
Insurance.....	0.9	0.6
Rent of equipment.....	0.4	0.4
Miscellaneous.....	3.1	...
Total.....	100.0	54.4

According to the classification adopted by the electric railway census, four items other than those above mentioned appear under the general heading of equipment. These include "Miscellaneous equipment expense;" "Depreciation of equipment," and "Other operations." With regard to the first it may be safely said that two-thirds have to do with the cars that are in service, so that two-thirds of this charge have been transferred to the list of affected accounts. The item covering depreciation of equipment is obviously directly proportional to the number of cars required to do the work, and all of this item has been transferred. With regard to other operations, probably two-thirds are directly affected

by the number of cars, and two-thirds of the percentage appearing under this account have been transferred.

The fourth item above referred to covers the maintenance of powerhouse equipment, and in connection with this it should be said that the census figures apply both to roads which purchase power and to those which produce their own energy, so that a strict adherence to the classification as shown in the census summaries makes the average road assume the rather unusual situation of generating two-thirds of its power and purchasing one-third. There is, however, no insuperable objection to this procedure, provided the method that is followed is understood. Upon this basis the item covering maintenance of power equipment would remain practically unchanged regardless of the reduced amount of power required under the conditions of higher speed. The reason for this is that the repairs for any power station of a given capacity and equipment are substantially constant regardless of the output, and in this case, except upon the largest properties, the change in capacity of the power station would be too slight to make any appreciable difference in the maintenance charges of the machinery.

The next item which appears in the summary of the census figures is that of traffic expenses. Clearly, this would not be affected by any change in operating methods because it depends upon the condition and character of the business done by the railway rather than upon the methods by which that business is handled.

Under the general heading of power, the first subdivision covers charges due to power-plant and substation employees. These charges could hardly be affected, even on roads of a very large size, by the slight reductions in energy consumption that are here considered. Therefore, the percentages expressing these items are not transferred to the list of affected accounts. The item covering fuel for power should vary in direct proportion to the energy consumption and, therefore, this item is transferred. The item covering other power supplies and expenses includes only some charges that would be affected by a change in power-station output. These should amount to approximately two-thirds of the whole item and, therefore, two-thirds of the figure representing the item are transferred. The item of power purchased should be directly affected by a change in power-station output as previously outlined, and the entire percentage, as shown, is transferred to the affected accounts. Other operations in connection with power can hardly be affected one way or the other, and this item is not transferred.

The item covering superintendence of transportation, under the general heading of conducting transportation, is also not subject to change with an increase in scheduled speed. It is true, of course, that a greater daily mileage from each car would result in correspondingly reduced

platform expense, but on the other hand, the number of car operations would remain unchanged, because as many cars would pass a given point during a given time under the higher speed as under the lower one.

In connection with the expense for conductors, motormen and trainmen, amounting to 29.5 per cent. of the total operating expense, it is plain that the increased daily car mileage that comes from an increase in speed will influence this charge in inverse proportion, and the item is transferred complete. The item of miscellaneous transportation expenses, however, should not change with the increased speed.

In general, the items under the heading of general and miscellaneous expenses should change but little under the assumed conditions. General expenses, which include the salaries of the various officials, manifestly would not be affected, because of different methods of operation. Injuries and damages would perhaps be affected to the extent of a slight decrease in interior accidents and boarding and alighting accidents, on account of the reduced number of stops and starts, and exterior accidents might increase because the cars would run past more corners without stopping. However, the two conditions might well balance one another. The item of insurance would change only in proportion to the extent of insurance that was carried upon cars and upon shops and carhouses. Two-thirds of this item have, therefore, been transferred. The items covered by stationery and printing, store and stable expenses, rent of track and terminals and other operations are small and can hardly be affected in any event. Rent of equipment would be directly influenced with the decreased need for cars, and this appears in the list of affected accounts.

With regard to results other than the reduced operating expenses that are to be expected from an increase in speed, it may be said that interest and depreciation upon the cars released is an important item. Because of the normal growth which may properly be expected upon any railway system, the release of a number of cars through more efficient operation would not result in keeping the cars in idleness, but would soon have an effect equivalent to a reduction in the number of cars owned. Each car is worth, roughly speaking, \$4000, and interest and depreciation on it would amount, at 12 per cent., to \$480 per year.

In round numbers the gross income of all operating companies for the last census (1912) was \$586,000,000, and this, divided among the 84,000 revenue cars in service, amounted to \$7000 per car, of which 56.8 per cent., or about \$3960, is operating expense. The above-mentioned interest and depreciation, amounting to \$480 per car, is 12.1 per cent. of \$3960 and may, therefore, be represented by a figure of 12.1 per cent. of the operating expense. However, an allowance of 1.1 per cent. of the total operating expenses has already been considered in connection

with the census figures, so that the figure here derived should be reduced to 11 per cent. to avoid duplication on this score. In other words, for each \$100 of operating expense, there will be an invisible charge for interest and depreciation on the cars owned which amounts to \$11. This, as explained above, is affected by the number of cars required to do a given amount of work and should be included with the items affected by faster schedules. In Table I is shown a list of these items totaling 54.4 per cent. of the operating expense, and when the 11 per cent. for interest and depreciation on cars is added a new total appears equal to 65.4 per cent.

TABLE II.—INCREASE IN SERVICE TO BE EXPECTED ON THE AVERAGE RAILWAY FROM A 10-PER CENT. REDUCTION IN RUNNING TIME

	Affected items expressed in per cent. of total operating expense	Increase in service made possible by each 10 per cent. decrease in schedule time, per cent.
Direct effect on operating expenses, (Table I).....	54.4	5.84
Interest and depreciation on released cars	11.0	1.18
Interest and depreciation on released shop and carhouse space.....	2.7	0.29
Total.....	68.1	7.31

In addition, for each car owned there will have to be provided about 800 sq. ft. of carhouse at a cost of \$1.25 per square foot, making a total of \$1000, and there must also be provided about 200 sq. ft. of repair shops for each car at a cost which will approximate, including equipment, about \$4 per square foot. This will make the total shop and carhouse facilities amount to about \$1800 per car. On large properties the interest and depreciation on these facilities would be affected by a small increase in mileage per car, and assuming interest and depreciation on the buildings and equipment at 6 per cent., the charge involved would approximate \$108 per car. As before mentioned, the operating expense on the average road amounts to about \$3960 per car, and on this basis the annual charge for shops and carhouses is equivalent to 2.7 per cent. of the operating expenses. However, this possibility would apply only in the case of the very largest systems, and as a means for differentiating the influence of the three general items, operating expenses, released equipment and shop and carhouse space, Table II has been prepared.

This is based upon an assumed decrease of 10 per cent. in running time, and the result of the faster schedule is expressed as the increase in service that could be made without increasing the operating expenses existing before the speed was changed. It indicates that, under the most

favorable circumstances, an increase in service of more than 7 per cent. will accompany a 10 per cent. decrease in running time or, in the same proportion, an increase of 11 per cent. with a 15 per cent. reduction in the schedules.

Raising Speed by Increasing the Distance between Stops.—One of the unfortunate features of American city car operation is the short distance between stops. Even many operators do not appreciate the fact that the time that could be saved by eliminating one or two stops per mile is far more important than any improvement that can be made in the speed of passenger interchange. For example, $\frac{1}{4}$ to $\frac{1}{2}$ sec. per passenger may be saved by using wider platforms, lower steps and the like; whereas fully 10 sec. is saved by eliminating the stopping and starting period for but one stop, exclusive of the time for passenger interchange at that stop.

It has been too long an accepted theory that cars should stop at every crossing on demand and even in the middle of those blocks which are double the usual length. In New York, for example, where there are twenty north-south blocks per mile a car may be obliged to stop every 264 ft. The service would be improved immensely in that city if south-bound cars were to stop at the even-numbered streets and northbound cars at the odd-numbered streets.

In Chicago the Board of Supervising Engineers reported during 1913 that well-loaded cars made 82 per cent. of all possible passenger stops in the North and West Side districts where there are twelve to sixteen blocks per mile. This meant distances of 440 ft. and 330 ft. respectively between stops. The board recommended eight stops per mile or 660 ft.

Compare these figures with the practice in Germany where the stops are usually at fixed intervals regardless of street crossings. A writer in the Jan. 4, 1915, issue of *Elektrische Kraftbetriebe und Bahnen*, placed the average distance between stops as 1312 ft. to 1640 ft. (400 to 500 meters). Yet he calmly worked out the argument that the greater part of the public as well as the railways would be benefited if the present distances, which would make an American operator leap for joy, were extended to 1968 ft. (600 meters) and even 2132 ft. (650 meters). We quote these figures to show how unfair it is for the American public to demand eight to ten stops per mile and still expect fast and safe service. That our street railway car speeds are actually faster than those of European lines is due almost entirely to their more modern equipment, including air brakes, and greater motor capacity per passenger carried.

It was shown by B. J. Arnold in one of his reports to the city of San Francisco, 1912, that the schedule speed would be increased 5.6 per cent. for every stop per mile eliminated. He referred to Market Street where the stops were nominally twelve per mile, or at intervals of 440

ft. In practice, however, the stops were more numerous, corresponding to an average of 368 ft. a minimum of 137 ft. and a maximum of 678 ft. The effect of line congestion was also shown by the scale of speeds in San Francisco, these ranging as follows: Terminal district, 4.4 m.p.h., second zone, 6.7 m.p.h., third zone and with little vehicular movement, 8.9 m.p.h. and fourth zone, 11.3 m.p.h. Such a range of speeds may be duplicated in many cities and shows the rich field for traffic regulation.

The Skip-stop.—The movement for a longer spacing between stops, or the "skip-stop" as it is popularly called, has been gaining ground within recent years as its advantages have become better recognized. It is beneficial to the railway for the reasons already given and to the passengers because of the higher schedule speed furnished without any increase in maximum speed. There seems perhaps no one improvement which can be so easily made in city railway operation as this and yet afford such returns to the operator and patron. Of course, with the skip-stop plan the points at which cars stop should be designated distinctly by signs or pole markings.

A variant of the skip-stop plan is the "alternate stop." This means that one car will stop only at every first, third, fifth crossings, etc., from the outgoing point, while the following car will stop only at the second, fourth and sixth crossings. Such a scheme can be easily applied in the many American cities where the main thoroughfares intersect numbered streets because a simple "Odd" or "Even" sign will show where the car will stop. The alternate stop would be confusing, however, in cities where few or no streets are numbered. In such a case it is necessary to have every street sign indicate whether odd or even cars will stop at it. Otherwise a passenger would be liable to have the first car refuse his signal or if it did stop it might prove to be an "odd" car when he wanted an "even" one.

Skip-stops at Kansas City.—The Metropolitan Street Railway, Kansas City, Mo., has used the alternate stop on two of its lines since early in 1911. The odd and even system was put into effect on the Troost Avenue line on Apr. 20, 1911, after exhaustive tests had been made. The new plan proved its worth immediately, and on May 6 of the same year was applied to the Brooklyn Avenue line. Both of these are important lines. After three years of operation of the alternate-stop system officers of the Metropolitan Street Railway stated their belief that the plan was thoroughly worth while. The public also received the odd and even system well and has made no effort to re-establish the old style on the two lines on which the new method is utilized. The alternate stop system is used only during rush traffic hours on week days. The plan is not approved on Sundays, it has been found.

At designated hours metal signs are placed on the front end of cars,

marked "odd" and "even," respectively. The signs alternate, south-bound cars bearing the "odd" sign stop at 33d, 35th and other "odd" streets, while the "even" cars halt at 32d, 34th, etc. On the numbered streets running east and west, the company had a problem slightly more difficult, as the intersecting streets bear names and not numbers, such as Locust, Oak, etc. This obstacle was overcome by the simple expedient of painting signs on the line poles alongside of the track at such intersections, the words "odd" and "even" again being called into play. A reduction of 10 min. per round trip has been effected on the Troost Avenue line in the morning by virtue of the alternating stop system. The run is now made in 65 min. as compared to 75 under former conditions. In the evening rush hour the running time is 70 min. as compared to 75 previously. A 5-min. saving in the schedule on the Brooklyn Avenue line has been made on both morning and evening runs under the alternate stop system, the round trip formerly being made in 65 min. and now in 60.

While these savings of time are considered worth while, officers of the company are impressed particularly with the advantages which the system has developed of distributing the load more evenly. Under former conditions, when a car halted on a corner where a crowd was waiting, the entire group usually boarded the vehicle, even if another car on the same line was just behind. With the alternate stop in operation, about half of the members of a crowd find that the car is an "odd" one and therefore not desirable in view of their destinations. They therefore await the arrival of an "even" car, the load at rush hours thus being evenly distributed over the cars on the two lines operating under the alternate-stop plan.

The Skip-stop in Cleveland.—The skip-stop was established in Cleveland in 1912. The ordinance under which the Cleveland Railway operates gives the City Council the right to fix stops, and by exercising this right, under the advice of the city street railroad commissioner, the plan of eliminating every other stop on both inbound and outbound tracks was adopted.

A poll was taken on every line, and the majorities in favor of skip-stops ranged from a proportion of three to one up to eleven to one, the larger majorities coming from the longer lines where the saving of time was greatest.

In the plebiscites, cards (see Fig. 36) were distributed to all car riders of a given line as they boarded the cars. The cards set forth the fact that the council, through the city street railroad commissioner, had the power to make schedules and to fix stops, and that a faster schedule and better service could be maintained if cars stopped at alternate streets. The ends of the card were perforated for tearing and at one end bore the

words, "For the change," and at the other, "Against the change." Car riders were invited to tear off one end or the other and thus vote.

As soon as each line had voted the city street railroad commissioner eliminated substantially every other stop inbound and outbound, making stops as far as possible at alternate streets with spaces between them of 700 ft. or 800 ft. However this was exclusive of the downtown district, or that territory within a radius of about 1 mile from the Public Square, which is the heart of the city. One reason for non-elimination of stops in this district is, briefly, that this is the district of the short rider. Unless cars stop at every street intersection the intending passenger, in walking to the stop, makes up his mind to continue walking, and he

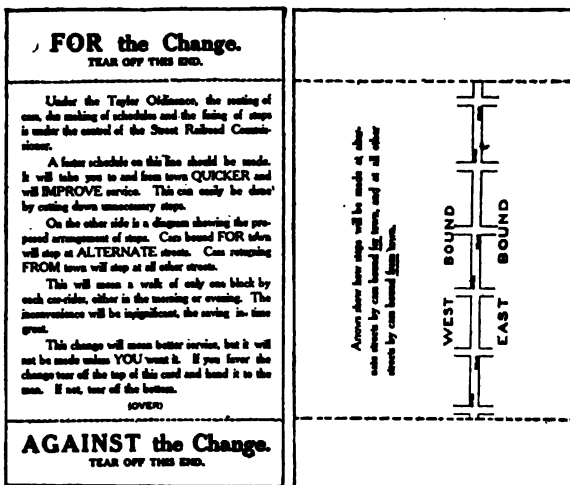


FIG. 36.—Front and back of Cleveland skip-stop ballot.

is lost as a rider. Again, the destination of substantially all of the riders of any trunk line is within the downtown district, and it would be unfair to ask them to walk too far. Further, within the downtown district, street car traffic is necessarily slow because of vehicular and pedestrian traffic, and safety stops must be made at many intersections.

The plan has worked well from its inception. The distance between stops is now in many cases more than 1000 ft. and averages for the system more than 700 ft. Nowhere is it under 500 ft. There have been eliminated 47 per cent. of the obligatory stops, and the schedule speed has been increased about 15 per cent.

Investigation in Chicago.—In December, 1914, the Chicago surface lines or Board of Supervising Engineers began a traffic survey to determine what stops could best be skipped to get higher track capacity outside of the loop district. The basis of operation was placed provisionally at eight stops per mile, a distance of 660 ft. or about every two blocks.

It was proposed to adopt this plan on two long routes in Chicago. One investigation was made on the Broadway line. Stops were counted and timed, and the number of passengers boarding and alighting was ascertained. Each stop was timed in the interval between the slowing down and starting up of a car during which passengers safely boarded and alighted from it. The average time, counted in this way, was 11.4 sec. per stop. To this should be added several seconds consumed when the speed fell below the normal during the approach to and the departure from the stopping place. In other words, the signal for a stop meant that a car began to slow down, and before it reached its normal speed again, some 14 or 15 sec. had been lost.

It was found that duration of stops was affected by condition of street pavement, condition of rails, number of persons boarding or leaving car, number of passengers on car, street lighting, and by the sex and age of the passengers. The early morning traffic could be handled more quickly than the evening crowd, and stops were longest in the period of the day when women and children formed the principal part of the load. For instance, the morning rush-hour checks, when most of the passengers were men who were quick in boarding and alighting, showed an average time per stop of 9.51 sec. The more leisurely crowd of women and children during the middle of the day required an average of 11.92 sec. per stop. Tabulation for the evening rush hour, when more persons were getting on and off, and when all stepped more carefully because of darkness, showed an average time of 11.77 sec.

Stops were made at only 50 per cent. of the regular stopping places, yet the fact that a stop signal might be expected at any of the other 50 per cent. of crossings held the motorman in check and did not give him the full benefit of time saving.

On the route in question, a distance of 10.7 miles, there were 127 places at which stops are required for safety or on signal. The number of actual stops per trip ranged from thirty-one to eighty. Outside of a congested district in which it was thought desirable to make all stops, it was found that 35 per cent. of the stopping places were unimportant if judged by the number of passengers boarding and alighting from cars. It was realized, however, that all of these places could not be cut out because some of them come in groups, and the result of their elimination would be walks of too great a distance for the people wishing to get on or off cars in those districts.

On another route—Clark Street—there are 120 stopping places between Illinois and Howard Streets. In a count of 23,274 passengers boarding and alighting from cars, almost one-half of them, in a five-day check, got on or off at the eighteen transfer points. Of the 102

non-transfer stops, fifty-eight showed a count below the average, this being 57 per cent. of the total.

Late in 1915 the skip-stop was tried experimentally on N. Clark Street, the skip-stops beginning beyond the first half mile (downtown) of the 10.7-mile route. The decrease in possible stops is from 120 to 70 and in running time per round trip 15 min. No changes were made, however, as the result of these tests.

Skip-stop Criticisms Answered in St. Louis.—The United Railways, in its application before the Public Service Commission for permission to eliminate car stops, replied in July, 1915, to criticisms of the proposed plan. As the points made are of general application, an abstract of the reply will be given:

About 7000 stops are now made in the operation of the street railway system in the city, and of these stops it is proposed to eliminate some 720. This will permit a saving of time that would be required in the slowing up, stopping and starting of cars at those points, and with the same general speed as is now maintained, it is estimated that from 4 to 5 min. will be saved on every line.

The selection of the stops to be eliminated has been made with reference to their present non-usage or the scarcity of passengers presenting themselves for passage, together with the minimum amount of additional walking distance to be imposed by virtue of the increased distance between stops. Stops are to be made in a systematic manner at alternate streets. At every point where cars stop, a red sign with "Cars stop here," or the equivalent, will be posted, and places where the cars do not stop will be indicated by a blue sign with appropriate letters.

Some idea of the immeasurable benefit that this plan will bring to those who ride upon street cars is obtained when it is considered that the United Railways Company now carries about 1,000,000 passengers per day. Assuming that 25 per cent. or 250,000 of these passengers save 5 min. per trip, a saving of 20,866 hr. per day is made, and if the value of this saved time is estimated at the low rate of 10 cts. per hour, the value of the time saved is \$2086 per day, or \$625,980 for the 300 working days constituting the year.

To this proposal of the elimination of these 720 stops some twenty specific objections were lodged, covering twenty different stops.

Criticism of the proposed plan can be classified as follows: (1) Some passengers would be required to walk further; (2) there will be a diminution in real estate values at the affected corners; (3) at the eliminated stopping points the speed will be too great, causing more accidents; (4) the company will get the principal advantage of the plan by reason of its ability to take off cars.

As to the first criticism, it has been shown in evidence that the average

increased walking distance is about 300 ft., and that this affects only the persons living in the immediate vicinity of the eliminated stops, a comparatively small number. At the rate of 4 m.p.h., which is the average walking rate, 300 ft. will be covered in less than 1 min. There can be little hardship in this short walk, and those making the walk will participate in the saving of time due to the elimination. In all large cities where rapid transit obtains, the stations are from three to four blocks apart, this being four and five times the distance between stops in the present proposed plan.

As to the diminution of real estate values, owners of real estate at the different corners have no vested interest in the operation of street railway cars. Their interests are at all times subordinate to the interest of the general public in its transportation facilities. A real estate owner cannot oppose his interest to the interest of the majority of the people. Whether or not street cars will continue to be operated in front of his property is a matter of chance, not of right. But aside from this question the diminution of real estate values is merely a surmise prompted by an overcautious imagination, as there seems to be no real reason why real estate should diminish in value either as to business or as to residential locations.

As to excessive speed, the speed of the cars passing over the non-stop points will be no greater than at any of the other places along the route. The evidence shows that even now one-fourth of the cars passing certain points do not stop at that point either for the reception or discharge of passengers. Therefore, the same condition that obtains now in practice will be put into effect in a more systematic manner.

As to the claim that the company will reap some financial advantage, the complainants have attempted to show that since the time for making the trip will be reduced the company will thus be enabled to give the same service with fewer cars and that there will be a saving in power and in wear and tear upon the cars. If this is true, it is a very urgent reason why the plan should be adopted. No one is benefited by economic waste.

Of course, there is no disposition on the part of the United Railways Company to do anything which would decrease riding on its cars. Its only hope for success is to use such methods as will increase its patronage, which can only be done by appealing to the convenience, pleasure and necessity of its patrons. It considers that in eliminating the stops, it would be doing something to save time of the great majority of its customers. The convenience of the public is its first and only consideration. If this proposed elimination is put into effect the speed at the non-stop points will not be any greater than at present. The time that will be saved will be that consumed in making the proposed eliminated stops.

Following this reply, the company was authorized to omit a number of

stops. On Sept. 1 it omitted fifty-five stops on the Olive and Broadway lines. Large blue signs bearing "No Stop" were put up at corners and other places, while the stops were designated with red signs, "Car Stop." Notices were posted also in each car on the Broadway and Olive lines, indicating stops made and those eliminated.

On Nov. 22, 1915, after three months' trial, the skip-stop was endorsed by the patrons of the Broadway and Olive Street lines by a vote of 67,558 against 21,395. The question was then placed before the Public

NOTICE

The sixty day test period established by the Public Service Commission for a test of the elimination of stops expires November 30th.

By reason of this elimination six minutes have been cut from the schedule in each direction on the Broadway Line, making a saving of time for passengers of 7 1/2 per cent, and three minutes have been cut from the schedule in each direction on the Delmar and University Lines, making a saving in time for passengers of 7 per cent.

With a slight increase in the number of eliminated stops a saving of at least 10 per cent could be made without increase in maximum speed.

This has been accomplished without taking a single car out of service. The passengers and not the Railway Company have received the benefit of this saving in time.

It is the desire of the United Railways Company to please its patrons and give them the best practicable service within its means.

In order to determine the preference of our patrons we will, on Monday, November 22nd, ask passengers on the Olive and Broadway Lines to vote whether they wish to continue the present elimination of stops and rapid transit, or desire to return to the old method of more frequent stops and slower time.

On Monday, November 22nd, ballot boxes will be placed in each car on the Olive and Broadway Lines and the conductors will furnish each passenger as he enters the car with a ballot by means of which he may vote for or against rapid transit.

The Public Service Commission and the Department of Public Utilities have been requested to supervise the vote and see that it is properly conducted and fairly counted.

United Railways Company of St. Louis

THE WILL OF THE PEOPLE.

OLIVE LINES

FOR RAPID TRANSIT,— 38,910

AGAINST RAPID TRANSIT,— 9,178

BROADWAY LINE

FOR RAPID TRANSIT,— 28,678

AGAINST RAPID TRANSIT,— 12,217

This is the result of the vote on Monday, November 22nd, of the passengers on the Olive and Broadway Lines to indicate their preference as to rapid transit and fewer stops, or slower speed and more frequent stops.

Fig. 37.—St. Louis car notice of stop plan and notice of result of ballot.

Service Commission. In the meantime, protests had been filed by a few property owners and storekeepers. In February, 1917, the matter was still held in abeyance by the commission. Two notices of the company in regard to the plan are reproduced in Fig. 37.

Rochester Skip-stops in Rush Hours.—In November, 1913, the New York State Railways—Rochester Lines—announced that skip-stop operation would be introduced during the rush hours on the several lines

that were equipped with trailers. These notices outlined in detail the method that would be followed in the selection of the eliminated stops and stated at what streets cars would stop during the rush hours.

In the selection of the streets at which rush-hour stops were to be made every effort was devoted to placing them as nearly as possible at intervals of 500 ft. At the same time, an attempt was made to serve those streets that had the greatest number of residences contiguous to the street-car lines. All of these details were fully explained to the public through the local newspapers, and about ten days after the notices had first been brought out the scheme was put in operation.

At the present time two-car trains are operated regularly only during the morning and evening rush hours. In consequence, there have been practically no changes in stops during other hours. On the lines where the scheme is in operation the stopping points are marked by plain white bands painted upon nearby poles, and at those streets where cars do not stop during the rush hours the following notice is stenciled upon the white bands: "Cars do not stop here between 6 a.m. and 8.30 a.m.; and between 4.30 p.m. and 7 p.m. except on Sundays and holidays."

Very little popular opposition to the plan developed at any time, although when the skip-stops were inaugurated a few protests against it were heard from some residents because their particular streets were omitted from the list of stopping points. However, after a few adjustments were made following personal interviews with the complainants, these complaints generally disappeared, and now that the system is permanently established it has been found that the company was obliged only to replace about 10 per cent. of the stops that were scheduled for elimination under the original plan. The elimination of the stops during the rush hours has made possible the operation of single cars and two-car trains on the same line without increasing the running time over that required when only single cars were operated, practically all of the cars making stops at the designated points during the rush hours whether operated as single cars or as trains. The saving in time for the trains approximates 10 per cent.

Express Cars in City Service.—Several companies have adopted another way of improving the service by operating express cars between the regular local cars in city service. The Boston Elevated Railway in 1913 commenced this kind of operation in the rush hours on certain routes where the segregation of through from local traffic appeared desirable. Early in 1915 the express cars were operated outward-bound in the afternoon rush hours from the rapid transit terminals at Dudley Street, Harvard Square and Sullivan Square. On the front and rear vestibules a 19-in. by 21-in. sign marked "Limited Stops" is hung as the car enters the terminal station of the rapid transit lines, announcement

of the first stopping point being made by platform men, motormen and conductors. In the morning, inward-bound cars approaching junction points where inspectors are located may be run as expresses to the rapid transit terminal upon order of the inspector. In this case the limited-stop sign is taken from the inside of the vestibule and hung in position, the car number being taken by the inspector. Inward-bound limited-stop cars stop to discharge passengers between the point of departure and the rapid transit terminals, and outward-bound cars of this class stop to receive passengers between the terminal and the first scheduled stop after beginning the express run. Of seventy-five outward-bound cars that are run from Harvard Square in one afternoon rush hour, twenty-five are in limited-stop service. With this close headway it is impossible to provide gaps ahead of the express cars, but the distribution of the traffic and the comfort of the patrons are much improved. As in the case of skip-stop operation there is more likelihood that people will use only the car that takes them nearest their homes.

Express Cars at Schenectady.—In the city of Schenectady a considerable part of the rush-hour traffic originates from the large plants of the General Electric Company and the American Locomotive Company, which are located not far from the center of the town. Almost all of this traffic is thrown upon the street railway within a few minutes after the closing hour of each plant, and in consequence a very difficult peak-load condition exists. However, the difficulties incident to this suddenly applied load have been relieved to a large extent by the introduction of a limited or express service designed solely to take care of the factory workers whose homes are in the outlying sections of the city and thus to relieve the congestion that would be inevitable under ordinary methods of operation. This innovation has been thoroughly successful in Schenectady, and it has met with very great popular approval since its introduction in 1915.

Under the scheme of operation of the limited service one car or two cars, depending upon the extent of the traffic, are assigned as express cars on each of the ten city lines and on each of the three interurban lines operated by the Schenectady Railway Company. These express cars are so placed in the schedule that they are the first cars to leave the loop at the factory entrance after the works close for the day. They are moved over a special route, used practically only for the rush-hour service, between the factories and the part of the city where distribution of the cars to the various lines may be accomplished and they are then run without stops to the outlying districts. In general, the express cars avoid the congested section of the city to reduce delays, and most of the cars on the various city lines make no stops at all until reaching the outlying sections. On interurban lines, the express cars make their

first stops at the city line. In consequence, runs of from 2 to 3 miles are made without delays and many of the factory employees are thus enabled to reach their homes in the suburbs of Schenectady 10 min. earlier than they would under normal conditions of service.

For its successful operation, the whole scheme depends upon the ability of all cars to adhere closely to schedule but as a general rule the express cars have the right-of-way over the regular service and crews on the regular cars are instructed to avoid interference with the express cars under all circumstances. Prior to the rush hour the average headway of the normal service on the different lines is from 10 to 15 min., but during the rush the headway for the regular cars is decreased by overlapping regular runs, thus reducing the intervals between cars to approximately 5 min. on a number of the lines. This regular service at 5-min. headway is operated from the factories for the rest of the rush hour after the express cars have been run out of the factory terminals, the fifteen or more express cars being dispatched all at once and as close together as is physically possible.

Express Service for Interurban Cars.—The express service described is that primarily in city or suburban service. Most interurban lines operate their cars to their city termini as express cars. Such cars stop to receive passengers on the outbound trip at any point at which cars in city service stop but do not stop to discharge any passengers on the outbound trip. Similarly they make the regular city stops on the inbound trip but do not accept any city passengers on that trip.

Far-side vs. Near-side Stops.—For many years there was general discussion as to whether cars in city service should stop on the far side or the near side of intersecting streets. Most city railways have now adopted the near-side stop. The principal objection in the past to the near-side stop has been that with rear-entrance cars and the front of the car opposite the crosswalk, passengers boarding cars must walk a full car-length to enter. Of course, this drawback is only a trifling one in good weather, but it is more serious when the streets are full of mud, snow or slush. This objection is not as important now as formerly, however, because paving conditions are better than they were. Undoubtedly the increase in number of automobiles has had a great deal to do with these improved paving conditions. Of course, with a center entrance car, even this handicap disappears because passengers then have to walk a half a car length whether the near-side or far-side stop is used.

However, we are most concerned in this chapter with the effect which each kind of stop has on the total number of stops per mile. Experience indicates that where traffic control obtains, the near-side stop reduces the number of halts since it eliminates the double stop, one at the near side of the crossing for traffic and another at the far side for boarding

and alighting passengers. In Rochester, for example, the near-side stop has saved 20 per cent. running time in the business district where prior to 1909, cars made two stops at each downtown crossing. Checking showed that the traffic stop at the near side was often as long as 35 sec. in addition to the 25-sec. loading stop at the far side. Some of the delay at the near side was due to blockades of loading cars at the far side so that the use of the near-side stop alone indicated a saving even greater than that effected through the elimination of the 25-sec. stop at the far side of each crossing.

In one large city, the introduction of the near-side stop eliminated 272 stops each way, released fifty cars for service to better advantage elsewhere and reduced the power peak by more than 5 per cent.

At Kansas City, Mo., the near-side stop has been a potent factor in raising the schedule speed 0.5 m.p.h.

In changing from the far-side to the near-side stops with rear-entrance cars, a slowing up instead of an acceleration of the schedule is likely, at first, even with several stops eliminated. The reason is that passengers wait for the car at the crosswalk to avoid mud and to be safer since other vehicles slow down on approaching the corners. Consequently, a boarding passenger is likely to walk a car length before boarding. Experience with the near-side stop will remedy this, but education will be hastened if the stop signs are placed at a point corresponding to the rear platform of the car.

In concluding our reference to the near-side stop, attention must also be called to its value in reducing collisions with crossing vehicles. The practice of too many drivers when approaching a crossing seems to be to consider their chances of beating the car across the intersection. If their judgment is good, they are successful; if not, there is a collision. With the near-side stop this choice does not occur to the same extent, since the hazard is reduced in proportion to the number of stops made on the near side.

Joplin (Mo.) is one city which has changed from the near side to the far side stop. The reasons given were delays in boarding and greater liability to collisions to vehicles coming from cross streets.

Signals.—Within the scope of this book it is hardly possible to discuss the use of signals either for promoting safety or for increasing the capacity of the track over the entire range of railway operation.

Beginning with single-track sections in city streets, there is no doubt that the simple light signal will go a long way toward speeding up the cars. Further, in double-track city operation with unusually bad curves and steep grades a cheap block signal might well be considered.

For suburban and interurban operation, signaling has become a highly specialized art. Here the manager would do well to consult the specialist.

CHAPTER IV

ACCELERATING TRAFFIC MOVEMENT ON THE CAR

Effect of Prepayment on Passenger Handling and Schedules.—

When the first prepayment cars were placed in use at Montreal in 1905, the platforms were as long as 9 ft. to insure the success of the plan. As Montreal cars are of the single-end type, the lengthening was at the rear platform only. On the earlier double-end prepayment cars in other cities, 6 ft. platforms were used. If the pioneers had not used such long platforms, it is doubtful whether the prepayment system would have met with the approval of the public. It was necessary to educate the people to have their change ready on the platform, and it was equally necessary to develop fare-collecting and registering machines which would operate as fast as a passenger could walk by the conductor's stand. The motor-driven fare box is a prominent example of developments still going on in such equipment.

Although the prepayment car is no longer characterized by the long platform, it is practically as fast as the old time car in ordinary pick-up service because the platforms are still big enough to take all the load at once, leaving the fares to be collected on the platform enroute, while the conductor does not lose time in waiting for a platform passenger to give the "Go-ahead" signal. The accompanying table, which is from the records of a prominent company shows actually faster time of passenger interchange than with the old-style car.

RECORD SHOWING TIME PER PASSENGER BOARDING.—JUNE, 1912.

Date	Pre-payment cars							Old-style cars							
	Stone Ave. Cross seats			Jones St. Long. seats				Main St. Cross seats				Smithtown Cross seats			
	Car No.	Total pass. on	Total seconds	Sec. per pass.	Car No.	Total pass. on		Total seconds	Sec. per pass.	Car No.		Total pass. on	Total seconds	Sec. per pass.	
6- 8-12 p.m.	2153	81	144.8	1.79				2012	83	184.3	2.22	2029	76	228.1	3.0
6-10-12 a.m.					2244	100	1.42	2012	21	56.8	2.70	2097	50	93.4	1.86
6-10-12 p.m.	2175	72	116.8	1.62				2014	47	107.2	2.28	2037	66	108.0	1.63
6-10-12 p.m.	2188	38	44.6	1.17				2027	71	118.3	1.67	2046	64	158.2	2.47
Average....		64	102.1	1.59		100	1.42		55	117.0	2.14		64	146.9	2.29

It would be idle to deny, however, that the prepayment car loses some time at congested crossings for people can rush into two doorways faster than they can be made to proceed in single file through one. The wide center-door car doubtless facilitates passenger interchange, but is not so successful in fare collection.

In most cases, the prepayment car has led to the abolition of smoking on the rear platform. This has caused little commotion for it is generally appreciated that the crowded city car is no place for habits which are distasteful to others. It is not likely that this has decreased riding in the least. The point which is more likely to displease the patron of the genus male is the rapidly growing practice of completely vestibuling the platform. Long has it been the American citizen's joy to jump on and off a moving car. This the folding step and door inter-operation with no outside handles effectually prevents.

To get every fare was one purpose of the prepayment car; to save every limb has proved an even bigger and worthier purpose. The placing of the conductor on the rear platform and the motorman's control of the front exit not only proved a most effective way of tallying passengers but of saving them from injury through their own negligence. Accident prevention has not been limited to doors and steps but has been enlarged by using air brakes and even to employing automatic control systems which prevent the car from starting until all doors are closed.

Passenger-handling Records.—In former days the arguments concerning the comparative loading and unloading efficiency of cars were confined principally to the retarding or accelerating effect as regards loading and different arrangements of seating. The field for discussion has been greatly broadened, however, by the development, first, of the different prepayment designs with their separate exits and entrances, and second, by the introduction of the several low-entrance cars. Therefore, it is no longer a question merely as to what is the most desirable combination of transverse and longitudinal seats, but rather of determining what kind of car permits the passengers to reach not only the platform but the seats with the least interference from alighting passengers. The low-entrance construction should greatly facilitate the initial movement of the boarding passenger from the pavement to the conductor without losing this advantage through slower inside movement on account of ramps, provided the fare-paying space is large enough to accommodate six or eight passengers at one time.

No comparison of passenger-handling records is satisfying unless a plain distinction is made between figures obtained at congested corners and those secured in normal stop-to-stop operation from one end of the route to the other. Data taken at the congested corners will show a faster passenger movement than elsewhere, because the motorman and

conductor usually open the doors before the car has come to a standstill, while the eager passengers are frequently guided to the best advantage by the local traffic inspector. On the other hand, stop-to-stop operation may mean taking as much time to handle one passenger as a dozen. The radically different results to which these diverse observations lead are indicated by the fact that according to a count taken under terminal loading conditions a car with a step 17 in. high admitted one passenger every 1.57 sec., whereas according to the method of averaging all stops a car with a 14-in. step exceeded 2 sec. per passenger. A similar, though less important, distinction should be made between figures obtained in the rush hours and those secured during the middle of the day, when many of the passengers are children, elderly people, women with packages, etc. The character of door and step control, whether hand or air, is also a big factor—especially in the later hours of the day when the platform men are tired. Few operators realize that the mechanism must be operated at least every other minute. The kind of prepayment fare collection system used is also an important factor in accelerating or retarding passenger movement.

The rate of passenger interchange—that is to say, the average time required for each passenger to board and alight—is of particular importance in a comparison of end-platform cars with those having conflicting streams of travel, like the near-side, side-entrance and double-deck cars. It is also to be expected that the double-deck cars will prove somewhat slower than a combination of motor car and trailer in view of the stairway climb.

The best car from a quick interchange standpoint is the one that absolutely avoids conflicting streams of travel. It is not only a question of "Please Leave via the Front Way" but of making the front way the easier way. If the motorman is obliged to unlatch the door for every departing passenger he is not likely to do so with encouraging grace. He should be able to open the door by depressing a pedal or using air rather than by a motion which obliges him to leave his controller and brake handles.

Car-loading Studies Made in 1912.—Some studies along this line made in 1912, by W. E. Johnson, car engineer, Brooklyn Rapid Transit System follow:

At Philadelphia: Count made of fourteen cars between 5.28 and 6.00 p.m. at the corner of Market and Twelfth Streets. The average time to load near-side cars with 29¾-in. entrance was 2.5 sec. per passenger; pay-within non-bulkhead cars with rear entrance was 2 sec. per passenger; while some open-platform trippers were loaded at the rate of 1 sec. per passenger.

At Pittsburgh the end-platform inclosed cars with 27½-in. entrance

averaged 2.2 sec. per passenger at corners where crowds congregate. (In 1915 the Pittsburgh company stated that its center-entrance cars with single exit door permitted a loading time of little more than 1 sec. per passenger. The car doors at the center are so manipulated by the conductor that while only one door is opened for exit, two doors are available for entrance, making a stream on each side of the fare box.)

At Washington the cars of the Capital Traction Company showed as follows in loading time per passenger at cash fare and transfer points respectively: Prepayment with bulkhead doors, 2.27 sec. and 1.42 sec.; pay-within, 1.71 sec. and 1.45 sec.; non-prepayment 2 sec. for cash fares alone. Note in this case the difference in the cash and transfer speeds.

At Cleveland the evening rush figures were 1.47 sec. per passenger on six pay-as-you-enter cars and 1.51 sec. on seven pay-within cars with 54-in. entrance. In both cases the count was taken only during the standstill periods, neglecting all boarding during the moving of the open-platform pay-as-you-enter car.

At the Plant shoe factory, Boston, where thousands are dismissed at one time, seven pay-within cars with 54 $\frac{3}{4}$ -in. entrance handled 352 passengers at the average rate of 1.57 sec. per passenger. All of the foregoing figures were secured by Mr. Johnson under 2- and 3-min. headways where every fraction of a minute counted.

The car adopted by the Brooklyn Rapid Transit System subsequent to these studies is of the center-entrance type, comprising a railed central entrance aisle and exits on each side of this aisle. Prepayment is the usual practice except at the New York end of the Brooklyn Bridge, at Borough Hall loop and at the Atlantic Avenue subway terminal where passengers enter via all aisles on one side.

Chicago Passenger Interchange.—At Chicago the loading per prepayment passenger recorded May 17, 1913 showed the effects of entrance width and holiday leisurely movements as follows on the basis of five passengers entering the car at one time:

Width of entrance door	Rush hour	Maximum holiday
40 in.	0.95 sec.	1.46 sec.
34 $\frac{1}{2}$ in.	1.13 sec.	1.55 sec.
22 $\frac{1}{4}$ in.	1.45 sec.	

Figures on Speed of Car Loading.—As might be expected, the observations on the rates of car loading vary considerably, even with the same types of cars, depending on the conditions of loading, habits of the community observed, number of passengers boarding, speed of the conductor in making change, method of timing, etc. Where different types of

cars are compared, other important factors are reservoir capacity of car platform, width of entrance and height and number of steps. In several cases these observations have been charted to determine approximately the law with the conditions under which the test was made.

The report of the Board of Supervising Engineers, Chicago Traction, for the fiscal year ending Jan. 31, 1912, contained the curves shown in Fig. 38 of platform loading speed. This chart is a comparative study of the actual rate of loading in the single-platform type prepayment car as compared with the standard double-platform car of approximately the same platform dimensions. The observations were made under practically identical conditions, and the results show clearly the advantages of

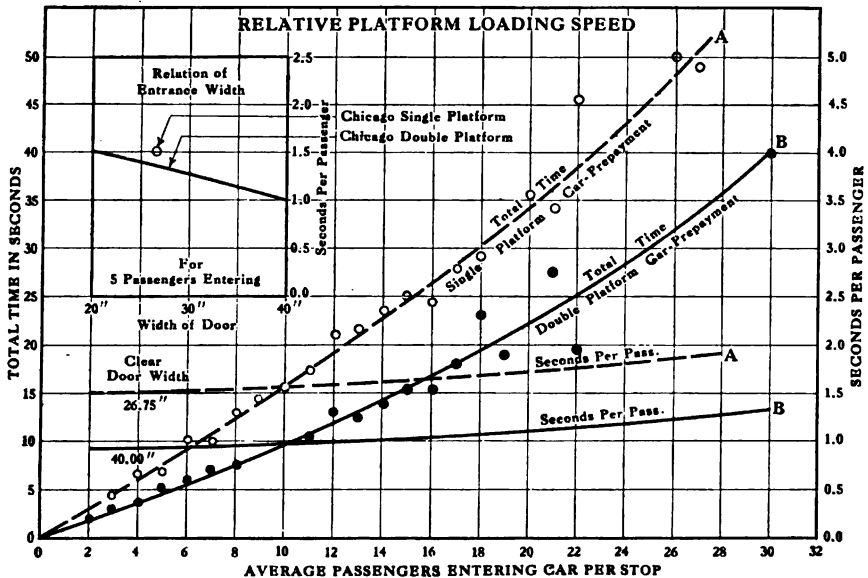


FIG. 38.—Curves from 1912 report of Supervising Engineers, Chicago Traction showing relative loading speeds of single platform and double platform prepayment cars.

double exit and large platform (6 ft. 9 in. in the 1911 arch-roof type) storage capacity where the most rapid handling of passengers is essential. The time of boarding taken in these tests was the period between the time the car stopped and the last passenger was on the platform.

Near-side Car, Chicago.—As to the near-side car, with which several lines were completely equipped to insure a fair test, the Board of Supervising Engineers says in its 1912 report:

"While subsequent experience proved that this new type possessed unquestioned merit, the limited platform space, together with the additional delay due to automatic doors, resulted in a loading speed about 50 per cent. slower than for the double-end

platform of the same length. Furthermore, the resulting congestion at the entrance intensified the congestion in the forward standing space, so that beyond eighty passenger total load (the car seated fifty-four passengers of whom thirty-two were in cross seats) distinct congestion resulted. And as the "car full" sign is not yet used in Chicago, this particularly constitutes a serious limitation in this type of car for maximum rush-hour service.

"In order to remove the objection to the present design of the near-side car, experiments have been made with a remodeled platform, in which the conductor is stationed just inside the carbody, thus leaving more platform space for absorbing the influx of passengers who have not yet paid their fares. This change in platform arrangement is being instituted in other cities on near-side cars, ostensibly for the same reason, and, if successful here, all of the equipment now operated will be changed accordingly. The change is not expected to remove entirely the confusion due to concentrating the loading and unloading at one point instead of the separation between the forward and rear platforms as in the standard double-platform type used in Chicago, but will undoubtedly be highly beneficial."

The later cars built for Chicago have been equipped with double platforms, indicating that this design was considered more desirable for Chicago conditions.

Association Studies of Car Loading.—In a report made in 1915 by the timetable committee of the American Electric Railway Transportation & Traffic Association, facts on the loading speed of fully vestibuled cars were presented substantially as follows:

In determining the average length of stop of a car with a particular type of platform, it must be recalled that the length of stop is not a function of the style of rear platform alone, but involves the facility for exit from both platforms. Again, the type of platform used has a greater influence upon the speed of boarding than upon that of alighting. Hence, if the platform is designed primarily to facilitate boarding, the matter of alighting will be covered. This is because the boarding movement takes place in greater mass than the alighting movement. Consequently, the values determined by the investigation of the timetable committee deal with the boarding movement of passengers only and a comparison of types relative to time consumed in boarding will suffice in showing the effect on schedule speed.

Each observation was timed from the instant that the car came to rest until the car started, regardless of incidental delays of passengers in boarding. For each type of car taken under consideration, about 2000 passengers were timed boarding.

This large number is necessary when some features of operation are considered, such as the personal equation. One conductor will open his gates before the car comes to a dead stop while another more cautious conductor will not, thus affecting the time of boarding, especially for movements of one passenger. This hasty opening of the gates or doors is encouraged if the motorman brakes his car at low rate of retardation.

This is especially true during non-rush hours when fewer stops are made. As a consequence of this, better opportunity exists for maintaining the schedule. The personal equation is also responsible for the length of the time interval between the giving of the proceed signal and the notching of the controller.

The observations, which are given in Fig. 39, show the accumulative average boarding time per passenger on cars with three different types of platforms. The curve for Type "A" represents this time for cars with a full vestibule, Type "B" for cars with inclosed platform but equipped with gates instead of doors. Curve "C" is made from observations on cars with open platforms and neither gates nor doors. A supplementary curve for Type "C" was made which excludes

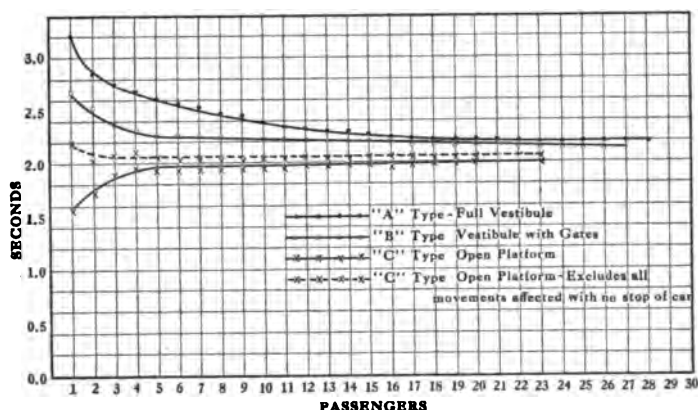


FIG. 39.—American Electric Railway Association chart showing cumulative average in seconds per passenger for boarding different types of cars.

observations of all movements during which the car did not come to a full stop.

TYPES OF CARS INVESTIGATED

Type "A"	Type "B"	Type "C"
Full vestibule Double-end car Available rear platform standing space 26 sq. ft.	Inclosed—gates Single-end car Available rear platform standing space 28 sq. ft.	Open platform Single-end car Available rear platform standing space 27 sq. ft.
Distance Street to step 14½ in. Step to platform 17 in.	Distance Street to step 12½ in. Street to platform 17 in.	Distance Street to step 14½ in. Step to platform 17¾ in.

The faster time for boarding of Type "C" is primarily due to the open platform, for with such it can be perceived that the time element

between the stopping of car and the boarding of passengers, and the time element between the completion of boarding and the giving of the proceed signal, is small.

The increasing value of the average seconds per passenger with the increase of passenger movement for Type "C" cars is due to the boarding of passengers before the car has come to a full stop. Boarding movements of one passenger are affected most by this fact. As the number of passengers per movement increased, the percentage of passengers who can board while the car is in motion decreases. This brings Type "C" curve nearer to the others, for high values of passengers per movement.

It can be seen that five to seven passengers are the maximum that can board before congestion commences. If all passengers boarded under similar conditions, the point at which congestion begins would be more defined on the curves. However, the making of change, delays due to various characteristics of passengers, etc., make it impossible for any group of passengers to board in the same time as any other group of the same number.

The influence of the open-platform type of car has already been described. For the reasons set forth the general average value of 2.01 sec. per passenger for the Type "C" car is less than the corresponding values of Types "A" and "B." When the movements effected with no stops of the car are excluded, the average value for Type "C" is 2.07 sec. per passenger.

In accounting for the higher average time of Type "A" over Type "B," two features of Type "A" must be remembered. The lower panels of the doors of Type "A" are of wood, whereas with Type "B" car the gates give a view of the platform and the passenger acts somewhat as he would in boarding an open-platform car, making a start for the step as soon as the car comes to a stop or near stop; that is, the passenger can see the interior of the platform before the car stops, so he has an opportunity to make up his mind as to the location of grab-handle, the exact height of steps, etc., and thus acquire an initial velocity for his boarding movement which cannot be obtained in cars with doors. These features are the cause of the higher average time per passenger of Type "A" over Type "B," especially for movements of a small number of passengers.

Referring to the curves it will be noted that the seconds per passenger for one passenger are as follows:

Type "A".....	3.23 sec. per passenger
Type "B".....	2.68 sec. per passenger
Type "C".....	1.59 sec. per passenger

When movements taking place without a full stop of the car are excluded these values compare as follows:

Type "A".....	3.23 sec. per passenger
Type "B".....	2.68 sec. per passenger
Type "C".....	2.19 sec. per passenger

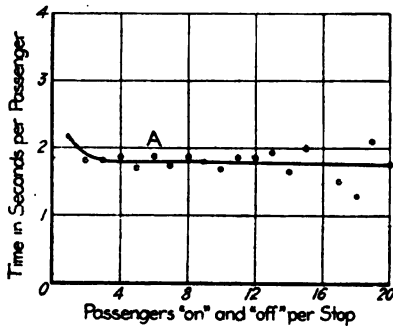


FIG. 40.

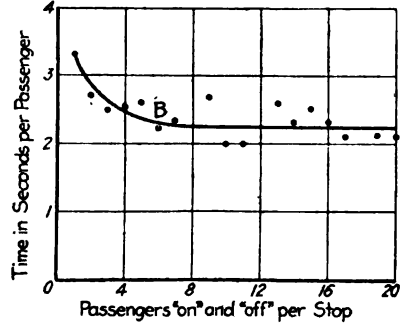


FIG. 41.

FIGS. 40 and 41.—Boarding records, Lafayette, Ind.

From the above and Fig. 39 it is seen that Types "A" and "B" are capable of handling large boarding movements with about the same facility. With Type "C," as the number of passengers per movement increases, the open-platform advantage diminishes and the value of the car as regards the speed at which it can be boarded approaches the values of Types "A" and "B."

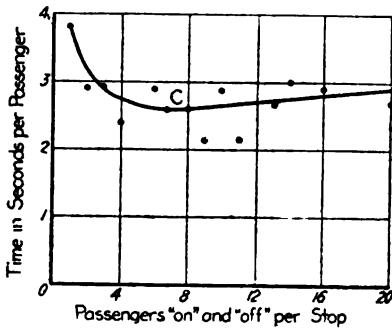


FIG. 42.

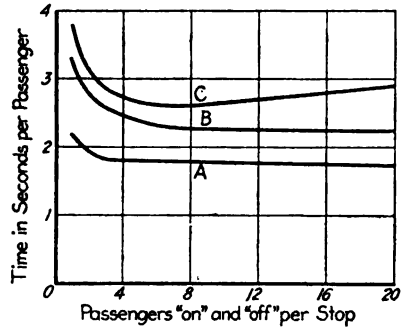


FIG. 43.

FIGS. 42 and 43.—Boarding records, Lafayette, Ind.

Boarding Records from Lafayette, Ind.—Figs. 40, 41, 42 and 43 show the results of some tests made by students of Purdue University on the local system in Lafayette, Ind., a city of 25,000 inhabitants, under the direction of Prof. D. D. Ewing. In commenting on the tests Professor Ewing said, in part:

The time necessary for stops may be divided into three parts: first, the interval between the instant of stop and the instant the first passenger steps on or off the car; second, the actual loading and unloading time (loading and unloading may be simultaneous) and third, the interval between the instant the last passenger steps on or off the car and the instant the car starts. For a given set of operating conditions the sum of the first and third of these intervals is practically constant. The time per passenger, however, decreases as the number of passengers "on" and "off" increases. When but one passenger is handled at a given stop this constant time may be quite comparable to the actual loading or unloading time, whereas when a large number of passengers are handled it is distributed and becomes almost negligible as compared with the loading and unloading time per passenger. The second interval obviously depends on the number of passengers handled.

The factors affecting duration of stop include: Type of car, method of fare collection, class of passengers, load in car, condition of landing at stops, weather, and vehicular and pedestrian traffic.

The location of the car entrances and exits, types of steps and doors and convenience of the entrances affect the first part of the stop interval. Narrow, inconvenient steps and doors tend to increase the interval, as also do step-folding and door-closing devices. Number of entrances and exits and their condition as regards whether they are properly separated or not, height of car floor above the street, and the arrangement of the seats and aisles affect the second part of the stop interval. The third part is affected by the type of doors, brakes and control used. A low-deck car without bulkheads, with ample and segregated passageways, permits rapid handling of passengers. While of very great value from the standpoint of safety, folding steps and doors increase the duration of stop because they increase the first and third parts of the stop interval. The method of fare collection affects the second and third parts of the stop interval. Collection at the car entrance decreases the speed of loading, thereby increasing the second part of the stop interval. The use of a fare box slightly facilitates loading. The third part of the stop interval is usually decreased because the conductor is in position to give the starting signal the moment the last passenger clears the steps.

The class of passengers handled has considerable influence on the first and second parts of the stop interval. Elderly people, shoppers, business men, office workers and clerks usually require a greater total time per passenger than do workingmen and young people on an excursion trip, because the latter classes are more active and more likely to have their fares ready if entrance collection of fares is used, and if it is not used they will tumble aboard without very much ceremony.

The load already in the car principally affects the second part of the stop interval. The first part, however, may be affected where only a few passengers are to be unloaded from a crowded car because they are unable to reach the exits quickly. When a number of passengers board a car which is already fairly well loaded, the loading time per passenger usually increases because the incoming passengers cannot clear the entrances and passageways rapidly enough. Muddy, snowy or icy crossings, and bad weather which makes the use of umbrellas necessary or coats the car steps with ice, generally increase the first and third parts of the stop interval. Congested vehicular or pedestrian traffic prevents passengers

from getting to the entrances and away from the exits quickly, thereby increasing the first and third parts of the stop interval.

The data from which Figs. 40-43 were plotted represent passengers "on" and "off." All of the studies were made in the winter and early spring. For small numbers of passengers the ordinate is the average of a large number of observations. For example, for one passenger the time as read on the curve in Fig. 40 is the average for 781 observations. The ordinates for the larger numbers of passengers are averages of fewer observations and for that reason the points are more scattered. The curve is drawn to average the points as nearly as possible.

It will be noted that the time per passenger decreases rapidly at first but soon becomes practically constant. This is because for more than four passengers, Fig. 40, the first and third parts of the stop interval become practically negligible as compared with the second part. On the line on which the data for Fig. 40 were taken the cars were loaded above their seating capacity on less than 7 per cent. of the trips. This line carries the class of passengers which might be expected on any average line in a city of the above population. Pay-as-you-enter, near-side cars seating thirty-two passengers carry the traffic. In the collection of fares a fare box was used. The curve shows that for more than four passengers the time per passenger is approximately 1.8 sec. For the entire number of stops observed in the traffic study on this line the average duration of all stops was 4.8 sec.

Curve *B*, Fig. 41, is plotted from data taken on a line on which all loading and unloading is done through the vestibule door at the rear. On about 10 per cent. of the trips the cars carried more than their seating capacity. One-third of the passengers were students.

The data for Curve *C*, Fig. 42, were taken on a short interurban line, passing the Indiana State Soldiers' Home, which is about 4 miles from Lafayette, and the passengers are mostly inmates of, and visitors to, the home and were often laden with bundles. The cars used were of the same type as were used on the second line described. On 20 per cent. of the trips the cars were loaded slightly above their seating capacity. The fares were collected by the conductor going through the car, but as the runs were usually long he ordinarily had plenty of time to get back to the rear end of the car before the next stop was made. The passengers were loaded and unloaded from the rear end only. As fewer observations were made on this line than on the others the points plotted in Fig. 42 are more scattered. To facilitate comparison the three curves have been replotted in Fig. 43.

It is proper to point out here that Prof. Ewing's criticism of folding doors and steps relates to manual and not to air-operated mechanism.

Accelerating Passenger Movement by Means of Low Steps.—To get the full benefit of low-step entrance on side-entrance cars the center well should be able to hold eight to ten passengers. Otherwise the slower movement of the first passengers up the ramp will delay those who are still entering from the street. For this reason the well in the center-entrance trailers of the New York State Railways—Rochester Lines—is 16 ft. 3 in. in length, or longer than the door opening by 5 ft. 6 in.

Low steps are not to be despised even in interurban service with short stops for "limited" trains. Thus the effect of a reduction in riser height on high-speed cars is shown by an experiment made by the 1914 committee on transportation engineering. On a car which had one 16-in. and two 14-in. risers the loading and unloading time was cut from $2\frac{1}{2}$ sec. to $1\frac{3}{4}$ sec. per passenger by changing to four steps with one 15-in. riser and three 10-in. risers and a slight increase in step width.

Effect of Seating.—The increasing length of average ride and the desire to supply seats which enable the passenger to face forward have led many railways to give up the idea that a car should contain longitudinal seats so as to get maximum passenger capacity. The principal modern exception is the pay-leave center-door car where at least the front half has longitudinal seats to secure what is practically a loading lobby.

The general plan now is to use longitudinal seats only for two to four seat widths adjacent to the doorways, transverse seats being used between. In single-end cars the longitudinal seats at the front are naturally of less total capacity because of one-way passenger movement; in center-entrance cars we find circular seats at the ends where a cab is provided for the motorman. But it looks to-day as if our railways were passing from the underseating to the overseating era. We find longitudinal seats on the front platform as a matter of course, despite rules against talking to the motorman, while several railways have placed benches on the devil-strip side of the rear platform. It has even been proposed to install a platform seat in front of the conductor's collection stand. In one low-floor center-entrance car a seat actually was placed at the head of each cross-seat aisle directly in front of the end circular seat until it was removed because it was found to be in the way.

Certainly this desire to seat as many passengers as possible is praiseworthy, but, after all, cars will have to be designed for easy passenger movement during the rush hours until that glorious day when the last as well as the first shall sit in the seats of the blest. Operators must remember that the real clearances in a car are not those shown on the drawings or by measurements made when the car is empty, but the width between the hips and shoulders of the seated passengers. When the cross seats are only 34 in. wide, the 24-in. aisle of theory becomes much less in reality. Constricted car passages mean delay in boarding and alighting. The logical thing is to make more use of seats which can be folded and locked out of the way during the peak of the load. This is the plan followed in the rapid transit cars of the New York Municipal Railway where the seating capacity, depending on door use, is seventy-eight or ninety.

Equipment and Street Factors that Affect Track Capacity.—In its fifth annual report covering conditions to the end of the year 1912, the

Board of Supervising Engineers, Chicago Traction, shows graphically the influence of car equipment and street conditions on headway and street capacity. It says that the maximum number of cars that can be operated over a single track is fixed by four factors: (1) Minimum safe interval between cars—service braking distance; (2) time to accelerate from rest and to clear berth; (3) average duration of stop; (4) allowances for motorman and brakes to act.

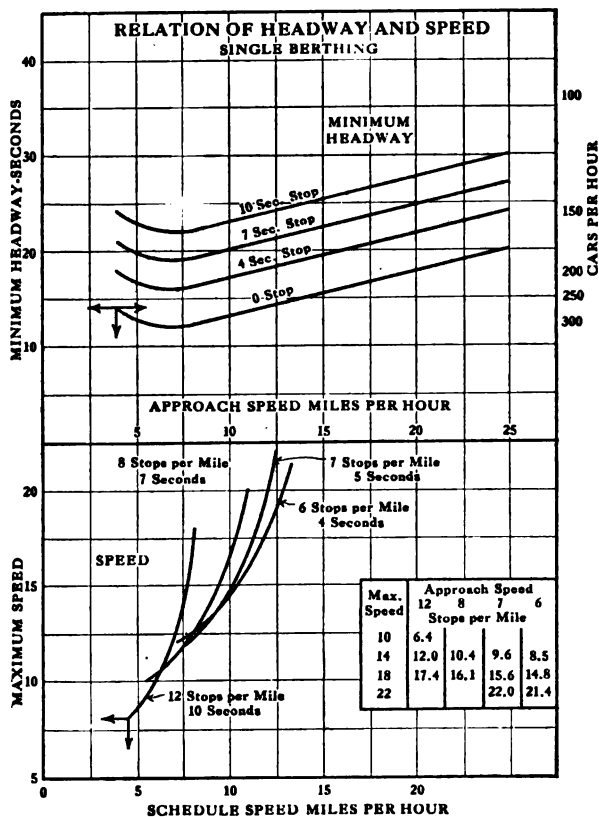


FIG. 44.—Minimum headway and speed characteristics (Chicago).

The sum of the above factors represents the minimum headway upon which, theoretically, cars can be operated, and their magnitude is determined by the following: Rates of acceleration and braking, speed of car approaching station at the moment of braking, stops per mile, and schedule speed required. Good operation and maximum capacity depend to a large degree upon the rate of acceleration and braking, hence the maximum rate consistent with the comfort of passengers and capacity of the equipment is desirable. Rates in test runs showed that

normal service resulted in rates of acceleration and braking from $1\frac{1}{2}$ m.p.h.p.s. to 3 m.p.h.p.s. The average appeared to be about 1.9 m.p.h.p.s. acceleration and 2.1 m.p.h.p.s. braking, both of which are accomplished without discomfort to passengers provided care is exercised in securing a uniform brake application. This is compared with a rate of 1.0 m.p.h.p.s. or less, used in many other cities for both acceleration and braking.

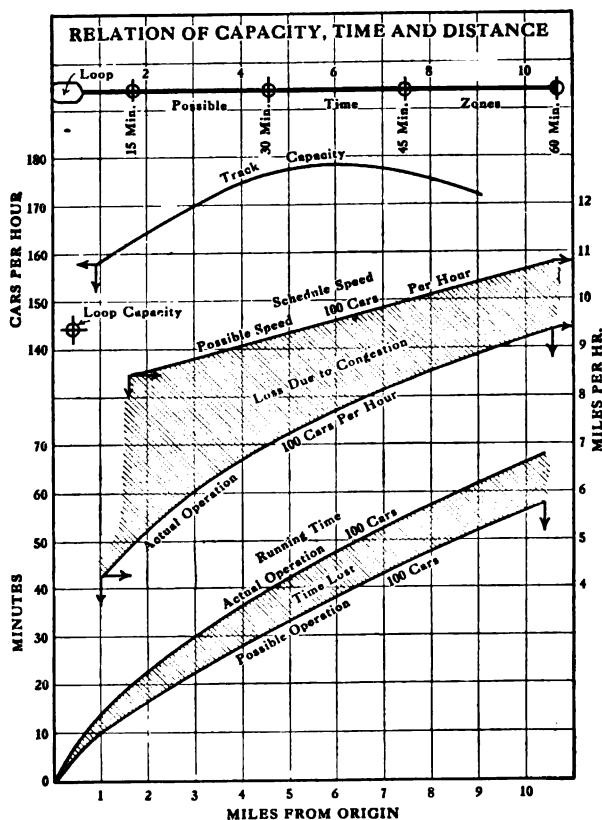


FIG. 45.—Effect of street congestion on speed and capacity (Chicago).

With the rates of acceleration and braking mentioned, the minimum headway with different lengths of stop is shown in the upper diagram in Fig. 44. These curves are based upon an operating cycle typical of the lines outside of the loop zone, in Chicago, namely, one in which the car is accelerated to full multiple at the normal rate, then coasts and finally brakes directly to a stop at a rate of 2.1 m.p.h.p.s.

This diagram does not take into account delays due to street congestion, so is purely theoretical so far as Chicago conditions are concerned.

Nevertheless, it is useful in giving a basis on which other situations can be worked out. As stated, it is based upon an acceleration rate of 1.9 m.p.h.p.s. and a braking rate of 2.1 m.p.h.p.s. The "approach speed," used as the abscissæ in the upper diagram, is the speed at which the car is operating just before braking is begun. As an example of the use of this diagram, assume an approach speed of 10 m.p.h. and 10-sec. stops. The minimum headway at which cars could be run under these conditions is 23 sec. which would correspond to about 156 cars per hour.

Actually, the minimum headway in the congested district does not depend upon the operating cycle but is dictated by the traffic signal at street intersections. Numerous observations show the interval between signals to be about 25 sec. With double-berth operation at intersections (*i.e.*, cars operated at crossings in pairs), two cars could cross the crossing in a given direction between signals—the equivalent of 25 sec. headway on each cross line.

Two other diagrams on the subject of headway, speed and track capacity which appear in the 1912 report of the Board of Supervising Engineers, Chicago Traction, are reproduced. One of them is the lower diagram in Fig. 44, the other is shown in Fig. 45. They were prepared to determine the maximum number of cars which could be run past a given point with a clear track under the conditions of acceleration and braking mentioned. To determine this the route was first divided into four 15-min. time zones, and the average number of stops per mile to load and unload passengers and average duration of these stops were taken to represent typical conditions. The values chosen were as follows:

Zone	Stop	Duration
15 min.	12 stops per mile	10 sec. each
15-30 min.	8 stops per mile	7 sec. each
30-45 min.	7 stops per mile	5 sec. each
45-60 min.	6 stops per mile	4 sec. each

From this table and the lower diagram of Fig. 44 the track capacity for each of the zones can be determined, and will be found to vary from a capacity in the loop district of 144 to a maximim capacity of 178 cars 5 or 6 miles away from the loop, as shown in the upper part of Fig. 45. The two lower diagrams in Fig. 45, indicate the loss in running time and schedule speed due to actual traffic congestion in the down town districts in Chicago where 100 cars per hour are on the line; that is to say, these diagrams show the difference between the physical capacity of the equipment under such conditions and the actual performance on the street.

Avoid Cars for the Classes and Sexes.—The use of cars for any but one class of passengers is exceptional outside of the Southern States

where the Jim Crow laws against negroes obtain in various forms for city and interurban lines. We do not have in mind here facilities provided in special cars for special trips, but reservations or distinctions in connection with cars on regular schedule which cannot but prove wasteful of car capacity and of time because of the delays caused in seating passengers.

From time to time surface and elevated electric railways in a desire to be obliging have run special cars for smokers. In the case of the New York subway a demand was made during 1912 that at least one car be reserved exclusively for women. In November, 1915, at the request of the health commissioner, the Chicago Elevated Railways began the operation of twelve fresh-air cars each coupled in the middle of a train so that those who did not care for windowless and doorless coaches might proceed elsewhere. The Chicago Surface Lines followed the same plan soon after with five cars each on twelve routes. With the first blasts of cold weather the cars were withdrawn. Such an innovation seems strange in view of the repeated failures to get Americans to enjoy anything but overheated cars.

An exception may be made with regard to priority at terminals as at four tracks of the Brooklyn Bridge where women are permitted, by means of a special stockade under police control, to board the cars before the genus male. The plan was put into operation in August, 1911, and would have been applied to all eight tracks if the clearance conditions had permitted.

The operator should be very chary concerning the use of such "class" cars or compartments. During the heavy hours they are but too likely to cause confusion and delay because the passenger will rush to the nearest seats no matter where they may be located. Should the cars be used only by those for whom they are intended, then the load will not be distributed in the most uniform way. It is hard enough to satisfy the demand for good service without adding the burden of class cars.

It is noteworthy that in Berlin, where the underground trains are furnished with smoking compartments, the company has been anxious to abolish them to avoid delays and eliminate the fire danger. Nevertheless the police department has not seen fit to permit this source of traffic congestion to be eliminated.

As noted elsewhere, some companies operate cars for workmen like miners, fertilizer makers, etc., whose occupations make segregation desirable. On the other hand, no American city railway has followed the example of Liverpool in giving a de luxe service at extra fares.

Move Up Forward Agitation by Newspapers.—It is refreshing to note that the stereotyped notice to "Move Up Forward" has been given new life by a progressive newspaper as well as by railways themselves. A year

or two ago the *Cleveland News* originated the so-called M. U. F. campaign. This campaign was inaugurated to get passengers to move forward in the cars and thus prevent congestion at the rear entrance. The Cleveland Railway followed up the movement by posting in the cars signs reading "Please move forward." The campaign included the formation of a voluntary organization the members of which agreed to move up forward and to encourage others to do the same, badges being furnished to all members. It proved thoroughly successful and was even supported strongly by the local labor organizations. The same plan was followed by the Pittsburgh Railways, but in that city the campaign was started by posting signs upon which were the letters "M. U. F." Considerable speculation as to the meaning of the signs was produced and this attracted a great deal of attention to them. We fear, however, that such movements will lose their effectiveness after their novelty has worn off. Front-end exits provide a far more reliable aid toward speeding up the line and avoiding unequal loading.

Car Full Signs.—"Car Full" signs to discourage the overcrowding and useless stopping of a delayed car have been tried in several cities. The New York Railways tried the scheme a number of years ago. The sign was displayed by the motorman upon receipt of a four-bell signal from the conductor and the car then picked up no more passengers. A similar plan was tried in Boston in March, 1913, the car full signs being carried in the vestibule and turned up so as to come into sight at the order of the traffic inspectors on the street. Cars upon which the signs were shown made no stops to receive passengers until reaching their destinations. The plan was adopted only for lines on which the headway was 2 min. or less. These signs have also been used by other companies. The Public Service Railway places its "Car Full" signs at the right of the motorman and directly below the illuminated destination sign.

EFFECT OF SIZE OF OPERATING UNIT ON TRAFFIC ACCELERATION

Larger Capacity per Operating Unit.—The first efforts of electric city railways in accelerating traffic movement on congested lines was to replace the short single-truck car with the longest double-truck car that could possibly make the track clearances of the system. To be sure the reduction in platform men was the leading motive at first, for there was a big saving in money and breaking-in troubles to have but four men on two big cars as against six men on three small ones. Yet it was also appreciated that even if the platform savings should be offset by the cost of hauling big cars half empty for most of the day, the demand of the rush-hour service was a compelling reason for their use.

When the big-car movement was at its height a decade or more ago, trailer operation as a means for increasing the capacity of the line was not popular. Trailers, where used, were but ramshackle horse cars and the public considered a ride in them a species of degradation. To-day the betterments in car equipment for train operation have reached the point where two-car service may be given with safety, speed and comfort. It would hardly be true to say that the public has lost all its prejudices in this respect. Let the trailer be decidedly different from though actually more comfortable than the motor car, some folk will avoid it. The motor car is nearly always better loaded than the trailer, especially when the floor level of the trailer is conspicuously lower. This prejudice will doubtless disappear in time, as it already has in Pittsburgh and some other cities.

Operators can point out that the trailer is actually safer than the motor car. Since 1902 the German electric railways have published figures annually in proof of this fact. In that year owing to the public impression that trailers were responsible for more accidents per mile than motor cars, the German Street & Interurban Railway Association began to segregate accident statistics for each class of car. These figures for 1912 show that the accident risk of a motor car was 2 to 1 for a trailer in 1902, 2.7 to 1 in 1903, 4.2 to 1 in 1904, 5.4 to 1 in 1905, 5.3 to 1 in 1906, 3.3 to 1 in 1907, 3 to 1 in 1908, 3.2 to 1 in 1909, 3.2 to 1 in 1910, 3.2 to 1 in 1911 and 2.4 to 1 in 1912. Obviously this greater security of the trailer is due to the elimination of front-end collisions which are always in excess of rear-end collisions as they include collisions with vehicles.

With two-car operation in practice a far more flexible service obtains than with big cars. The latter must be run full or empty for they cannot be much reduced in number during the normal hours without complaints about long headways. In train operation, on the other hand, the superfluous unit is dropped and what remains is a frequent service with units of smaller but more economical capacity. As the trail car requires but one man instead of two, the superiority in platform cost of the big unit may be cut down to a degree which no longer offsets its greater expense during hours of light travel.

Of course, there are routes on some systems where the biggest car possible is decidedly the car for any part of the day. Such a route is Broadway, New York, but there are not many Broadways in this land or any other.

Let us now consider whether traffic may be accelerated by increasing the capacity of the operating unit whether single or double and whether the increase is made vertically or horizontally.

The Double-deck Car.—First a word may be in order as to the double-deck car. At this writing one is in use in New York, one of similar type

in Columbus, one in Washington and ten in Pittsburgh. The last city, therefore, is the only one which is giving more than a tentative service, and the reason will appear in the sequel.

Double-deck cars, of course, are no novelty. They are dearly beloved by the deliberate Britisher, less popular in the British colonies and hardly regarded anywhere else. Like the long car the double-decker's advantage is capacity, but its disadvantage is sluggishness. It is very attractive to carry twice as many people with the same two men, but not so pleasant to drag the line because of slower passenger movement and more stops. The Vienna Tramways, for example, has found it necessary to have one extra conductor on its double-deckers for heavy loading points at least.

Some double-deck designs slow up the line because opposing streams of travel are permitted on the same stairway, and others have risers that are too steep.

The single double-decker in use on Broadway, New York, is in retail pick-up service, that is to say, passengers are picked up in small groups and not in car-loads. The result, as observed on a short headway line like Broadway, is that the double-decker does not carry a load proportionate to its capacity. This holds true despite the fact that a certain percentage of strangers prefer it for the novelty of riding on the sightseeing upper deck.

In Pittsburgh the double-decker is primarily for rush-hour service. In the evening it is particularly useful in handling people from the great factories in batches of 250 to 300 riders apiece. The Pittsburgh double-decker is therefore justified because it makes full use of its excess capacity. Moreover, it does not tend to drag the line since the load is discharged under favorable mass and headway conditions.

Two-car Service.—As with the big double-truck and double-deck car, the advantage of two-car operation is an increase in capacity and the disadvantage, a slowing up of the line unless the number of stops can be kept low.

First of all we should be very certain, as in the case of the double-deck car, that the train will be satisfactorily loaded. If it is filled to capacity at one or two points all is well, but if the two-car train follows on the regular headway, passengers are picked up in small numbers and the total load may be only 50 per cent. instead of 100 per cent. greater than that of a single car. It should be remembered that the tendency of the passenger is to take the first accommodation that comes to hand, be it single car or a train.

Second, a thorough study of the stop question is necessary. It is very easy to go astray on this point by what one sees on the downtown tracks. There the short spacing of cars and their crawling pace evidently indicate that double-deckers, trailers or motor-car trains would increase the

capacity of the track as there would be no addition to the number of stops. But different conditions arise on reaching the tracks over which only one line is operated. Here we may find that the single car makes only five to six stops per mile so that it can maintain an average speed which will permit the round trip to be made in, say, 60 min. Suppose now we use any of the three high-capacity substitutes named. Then in all probability the stops in the unloading zone will become nine to eleven per mile and the length of the round trip will be increased 9 min. or 20 per cent. Thus 20 per cent. more car capacity will be required to carry the same number of people in a given time.

The only place then where double-deck or train operation would be a sure success is on those lines where the single cars are already of maximum capacity and where the unloading points are so spaced that the number of stops will be no greater when the transportation unit is doubled in capacity. At Rochester, for example, the trains make as good schedules as the single cars on the same line because nearly one-half of the original stops in the unloading zone were removed.

In Montreal, where two-car service is given on St. Catharine Street for a large part of the day up to 7 p.m., tests made early in 1914 showed 8.1 stops per mile compared with 12.9 stop signs per mile. The actual distance between stops was therefore 652 ft. instead of 410 ft. These trains are operated on a 4-min. headway in alternation with a single-car service also on 4-min. headway. Safe and quick starting is promoted by using a pilot lamp which shows the motorman that every door is closed. The concentration of incoming travel at the center via two adjoining platforms permits quick passenger boarding. With eight stops per mile no difficulty arises in making the round trip of 17 miles at 7.5 m.p.h., and even 9 m.p.h. could be obtained on lighter halves of the run. Local ordinances, however, limit the speed to 8 m.p.h. in any event. Evidently the maximum number of stops is not required despite the fact that the stop signs are 410 ft. to 418 ft. apart. Clearly the alternate single-car service in Montreal must be frequent enough to avoid an excessive number of stops for the two-car trains.

A third essential factor in the success of train operation is that the rate of passenger interchange should equal that of a single motor car. It cannot make up defects in this respect merely by the 25 to 33 per cent. saving in getting over downtown intersections as compared with two independent units. To avoid losses it must place the two entrances at the abutting platforms so that the passengers will not hesitate for the fraction of a second or move in conflicting directions. For this reason we favor the combination of rear-entrance motor car and front-entrance trailer to that of a motor car with a center-entrance trailer. The latter combination has manifest advantages from a seating standpoint com-

pared with double-end cars, but it is somewhat slower. In the south it is favored because one side can be used for white and the other side of the entrance for colored riders.

Fourth in the success of train operation are the equipment factors: Are the wyes and turn-outs long enough to permit train operation, and will the reverse curves permit the platforms of the two cars to swing in opposite directions? Are the motor and brake capacities of the train equal in acceleration, running speed and braking to that of single cars on the same line? Are the coupling and other train make-up devices quick and can the trains be made up near the loading places to save mileage? Are the conductor's slow cord signals superseded by automatic signals given to the motorman as the last door closes?

Trailers versus Double Motor Cars.—If the economy of train operation is accepted, the operator may choose any of four combinations: Four-motor or two-motor car and trailer; four-motor car and two-motor trailer, two two-motor single-truck cars with vestibule intermediate (the articulated car).

It is understood that train operation is considered here only as it applies to daily rush-hour service and not to holiday travel. Hundreds of companies operate trailers for the latter purpose and but two score or so for the former, as noted in the following list of January, 1916:

PARTIAL LIST OF CITIES REGULARLY USING TWO-CAR TRAINS IN PARTS OF
THEIR SERVICE

Birmingham, Ala.	Memphis, Tenn.
Boston, Mass.	Milwaukee, Wis.
Buffalo, N. Y.	Montreal, Can.
Charleston, N. C.	New Orleans, La.
Cleveland, Ohio	Newark, N. J.
Cincinnati, Ohio	Pittsburgh, Pa.
Columbus, Ohio	Portland, Ore.
Denver, Col.	Rochester, N. Y.
Des Moines, Iowa	Savannah, Ga.
Detroit, Mich.	St. Joseph, Mo.
Fort Wayne, Ind.	St. Louis, Mo.
Houston, Tex.	Spokane, Wash.
Indianapolis, Ind.	Springfield, Mo.
Kansas City, Mo.	Toledo, Ohio
Louisville, Ky.	Toronto, Can.

The earlier users, as Denver and Pittsburgh, have favored the motor and trailer combination, particularly with the center-entrance trailers without or with low-floor entrance. The main reason has been the high seating capacity, cheapness and lightness of the trailer as compared with an extra motor car. But this combination is not the most effective in making quick schedules. Hence a point may be reached on some sys-

tems where two motor cars with multiple-unit control would readily be more economical despite higher first cost. The factor of reliability has led at least two systems which operate trailers now to consider double-motor-car operation. On these properties the motor car has ample capacity to haul a trailer for an hour or so, but should it break down, a train behind would have the task of pulling one car and pushing two others. This eventuality cannot be ignored in the light of its effect on the whole rush-hour traffic.

A compromise is offered by the use of a four-motor head and a two-motor trail car. The latter car, unlike the trailer, never has to be stored in the street to the annoyance of the people living near the make-up tracks. The trail-car conductor acts temporarily as a motorman to bring the car to the coupling point. With six motors, the train is far less likely to be helpless because of motor trouble. Then, too, the two-motor trail car may be used during some of the lighter hours to the exclusion of the heavier four-motor equipment.

Articulated Cars.—The combination of two single-truck cars with a vestibule between as used at Boston, Mass., Portland, Ore., and Richmond, Va., is of rather limited application. Primarily it represents an endeavor to make more economical use of existing small cars, especially where sharp curves discourage or make impracticable the use of big double-truck cars. The Boston car is of center-entrance and exit type and the Richmond car of center-entrance and front-exit type. Oscillation also makes the use of single-truck articulated units undesirable.

Train Operation on Interurban Railways.—Frequent service with single cars has been the chief reason for the success of the interurban electric railway in winning business from steam competitors or actually creating traffic. Therefore, any proposal to enter train service can be considered only on those roads where the headway will remain short enough to get the business, and where the operation of all cars as units would be beyond the safe capacity of the track and signal layouts. An hourly headway is perfectly satisfactory on most interurban lines. It is assumed, of course, that the extra cars are justified either by the additional passenger business or because it is desired to haul baggage, express, smoker, buffet or sleeping cars.

Unless the extra cars are required only over short sections within the overload capacity of the motors, they should be motor cars and not trailers. In any event, all cars should be operated with multiple-unit control to insure quick make-up and safe operation from either end.

Station stops in interurban service are the same for a train of a given class whether it has one car or more. The number of stops at the relatively unimportant wayside crossings would be hardly more for a two-car train than for a single car, contrary to the conditions of city service.

As noted earlier in this chapter, easy steps and wide vestibule passages must not be neglected even on interurban cars. Time counts for one just as it does for the other. There is a growing appreciation of the side-entrance interurban car, since it permits simultaneous entrance and exit besides affording a most convenient division of regular passenger compartment on one side and smoking and baggage division on the other side of the platform. The center-entrance idea has been applied to two-car operation by the Northwestern Pennsylvania Railway, which uses the first car as a straight passenger and smoking parlor compartment while the second car is baggage and smoker. The passenger entrance is at the center of the train.

CHAPTER V

CAR TYPES IN RELATION TO TRAFFIC

The schedule maker cannot ignore the influence which the type of car used may have on traffic, operating cost, speed of passenger movement and accidents. Therefore, the treatment of schedules may well be prefaced by a review of car types in relation to traffic.

Prepayment Accelerated Car Improvements.—Up to 1905, the doors and steps of city electric cars showed no radical advance over those of horse-car days. A few cars for rapid transit service had been built entirely of steel, but the art of city car design seemed to have gone the way of Tyrian purple and tempered bronze. But in that year a pair of courageous Canadians, W. G. Ross and Duncan MacDonald, then respectively managing director and superintendent of the Montreal Tramways, showed a skeptical street railway world that pay-as-you-enter (prepayment) fare collection really was practicable. Practically all they did to revolutionize fare collection was to lengthen the conductor's platform, install dividing rails, provide two doors instead of one in the rear bulkhead, one an inwardly opening door for entrance, and the other an outwardly opening door for exit, and, finally, supply also a front-exit door under the control of the motorman.

Chicago, Newark, New York, and other cities followed Montreal in rapid order. With each installation came many new conveniences quite foreign to the question of prepayment itself. The electric railways were now eager to adopt a system of collection which would intercept fares previously missed and which, by keeping the conductor on the platform, would also avoid many boarding and alighting accidents. They feared, however, that the public would refuse to accept the new or rebuilt prepayment cars unless they showed manifest superiority in convenience and safety. Thus began an era of improvement which even after a decade is still in full vigor. Prepayment, therefore, is directly responsible for the use of longer platforms, wider aisles, inter-operating doors and steps and many safety devices; and it is indirectly responsible for the high-grade ventilation, heating and lighting which have made the American city car a marvel of comfort.

In the following paragraphs each type of car is described according to seasonal conditions before features of passenger movement are considered.

Open Cars.—The open carbody is closed only at the ends to form a windowed bulkhead or partition between the platform and the seating compartment. All but the end seats are reversible cross benches which are accessible only from a hinged running board on the side. This type has always been popular with the public for its airiness and sightseeing qualities. From the railway's standpoint, its merits are low first cost and great capacity. In temperate climes, however, this car earns money for only three or four months a year, its passengers run more risk of accident because the crew has no control over their movements and the lack of a drop platform for boarding adds the inconvenience of a high step. The problem of passenger control on such cars has never been solved any further than to use a guard rail and folded running board on the non-operated (devil-strip) side. Some companies oblige passengers to keep off the running board, but this rule robs the open car of its attractiveness for nothing is more disagreeable to seated riders than the narrow aisles of an open car blocked with standees.

Sometimes the step height difficulty is met by using a double running board or Z-bar, but each board is really too narrow for the foot; nor can this scheme be used in places where the lower board would project too far to give safe clearances. By means of the so-called "low-floor" motors new open cars can be operated with, say, 26-in. instead of 33-in. wheels. However, new open cars are rarely ordered now, the all-year convertible and semi-convertible cars being preferred. It is noticeable that several companies have actually rebuilt their open cars to convertible types, as Portland, Ore., Rochester, N. Y., and Atlantic City, N. J., all for the sake of having better control of passenger ingress and egress.

Convertible Cars.—The convertible car is a closed car with side sashes and panels which can be taken out to make it serve as an open one. As the removable panels extend all the way to the floor line, the car can be made as airy as the open type, especially if the sashes in the bulkheads and vestibules are not fixed. The passengers go to cross seats by way of end platforms and a center aisle. In summer the open sides of the car are screened or barred to avoid accident. While it is desirable that the removable sections should always fit snugly enough to keep out drafts, care must be taken not to return the panels at random, otherwise the car would look motley, due to the mixing of panels of different varnish ages. One objection to the full convertible car is its stuffiness during unseasonable spells of warm weather as the sashes usually cannot be raised or lowered. Another objection is the inconvenience and expense of storing the panels during summer. There is also the danger that the adjustable panels will become warped and cannot be made as tight as permanent panels.

Semi-convertible Cars.—The semi-convertible car is a popular compromise. No panels are removed, but any desired proportion of the upper and lower sashes may be raised into the roof or lowered into pockets at the sides. The former are usually raised beyond the line of vision, while the latter are dropped to elbow level. Overhead pockets mean a heavier roof; side pockets steal needed inches of aisle or seat room. If track clearances compel a narrow car, roof storage is favored. If side pockets are used, covers are provided to prevent careless riders from dropping rubbish or burning tobacco into them. For winter service this car is better than the convertible car because its windows can be opened to suit the individual passenger's whims, but it is not so good for summer use.

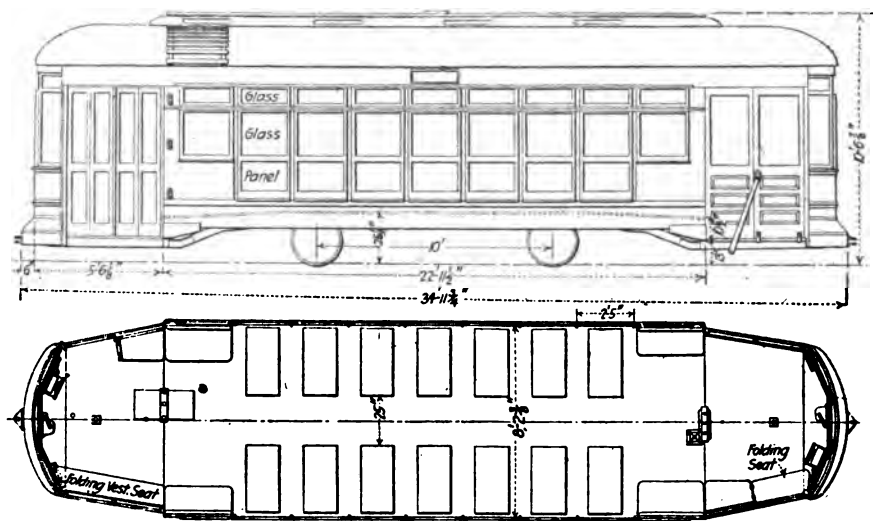


FIG. 46.—Low-level convertible car, Third Avenue Railway System. Note hinged top sash.

Convertible Cars with Hinged Ventilator Sash.—A mixed type, half-way between convertible and semi-convertible, is used on the Third Avenue Railway System, New York. This car has a large convertible sash with a 6-in. top sash arranged to slide into the roof. When the car is wide open, the small sash is stored in the roof and the large sash in the carhouse; when the car is closed, the small sash may be opened all or in part, for extra ventilation as wanted. A similar arrangement was added lately on the Philadelphia near-side cars, and it is also on recent cars of the Bay State Street Railway.

California Type.—The California type is a car made up partly of permanently screened open sections and convertible or semi-convertible

sections. This design is used only in an ever-mild climate, although it was once tried in New York because of a law which required a certain proportion of the cars on each line, even in summer, to be enclosed or have an enclosed section.

Ohio Type.—The Ohio type is a one-way operated car. The left-hand side has fixed or semi-convertible sashes and enclosed platforms; the other side has removable sashes. In winter this car usually has a longitudinal seat along the left-hand side and cross seats on the opposite side of the aisle; in summer the segments of the long seat are turned at right angles to the aisle to form a series of continuous benches as in standard open cars.

Closed Cars.—The closed car with non-removable sashes, commonly called a "box" car by shopmen, is quickly passing away on American railways. It is still common in Europe. It might be added here that European cars are often furnished with large drop sashes, but woe betide the passenger who has the strength, but not the diplomacy, to secure the consent of the conductor and fellow-passengers to open a window! Rules of this kind would hardly be relished by Americans.

Classification of City Carbodies as to Passenger Movement.—While one of the great advantages of electric over horse traction was that cars could be lengthened up to the limit of local clearance conditions, car designers did not see at once that while more persons had to be handled the platforms and aisles could be no wider than before because the spacing between tracks could rarely be changed. Even at this late day, innocent amateur inventors patent cars with beautifully roomy seats and spacious aisles but of most impossible widths.

The first practical effort to speed passenger movement was, first, to lengthen the platform; second, to use the famous "accelerator" door. This door was offset from the center toward the alighting side, giving the passenger a shorter distance between the interior of the carbody and the pavement. Far more radical changes have been made during the last decade, the "prepayment age," but we can still divide all city cars into the basic classes of double-end or single-end drop-platform, side- or center-entrance and double-deck.

Double-end Drop-platform Cars.—The double-end drop-platform car with the platform about 10 in. below the carbody floor permits the main floor to be reached more easily than by means of a double platform step and single floor level. The latter combination would either have to extend outside the carbody or rob the platform of needed space. In some cars this single step comes within the body line in order that the doors may enclose the step when the car is in motion; nevertheless valuable platform space is thus sacrificed.

The chief traffic advantage of the double-end drop-platform car is

that passengers may come in one way and go out another. In rear-platform prepayment the problem, therefore, is to devise means which will lead most passengers to prefer the front exit, thus inducing the current of travel to flow always in one direction and so avoid the congestion possible in center-entrance and near-side cars. The earlier drop-platform cars had fixed steps and no doors were under the exclusive control of the motorman or conductor. In their prepayment successors, the steps close or open in unison with the vestibule doors which are operated either by hand or by means of air by either of the crew. Pneumatic operation is to be preferred in the relief it affords the crew and in the acceleration of traffic. The modern cars are divided into two types—pay-as-you-enter and pay-within.

Pay-as-you-enter Cars.—The pay-as-you-enter car (the original form of prepayment) has a platform which is railed off into entrance and exit and which may or may not be enclosed with doors or gates. The passenger pays fare to a conductor who is stationed on the platform and then enters the body through a sliding or swinging door which is sometimes under the control of the conductor. He may leave the car either through another door at the rear, not usually under the conductor's control, or through a front-body doorway and thence through a vestibule doorway which is under the control of the motorman through some pedal or lever mechanism. This door is occasionally placed right next to the front bulkhead to save a step for the passenger, but this arrangement is not common because it obliges the motorman to turn around when watching the passenger leave the car. On a double-end car, all or part of the railings are raised to the ceiling when the platform is used for exit, but in a single-end car the railings are fixed. In a number of southern cities the entire space of the open rear platform is available for passengers for the reason that the conductor stands in an alcove on the car-floor level formed by setting the bulkhead back about one seat width. The merit of this plan is that it makes unnecessary a long platform for cars of medium length, say 30-ft. body. The obvious demerit is the loss in seating capacity.

Pay-within Cars.—The pay-within car is completely vestibuled, but the bulkheads generally are removed so that no partitions or doors exist from end to end. The 1915 Bay State car, however, has very narrow door pockets to permit closed-body operation when desired. Where cars have been rebuilt for pay-within operation, a portion of the bulkhead as wide as a longitudinal seat has been retained sometimes to carry a switch-board panel or the like. The passenger enters an absolutely free platform, as the conductor is stationed at the edge of the carbody floor at a dividing pedestal, which carries his fare box, the air or manual levers for the control of the vestibule doors and possibly a connection for the emergency

operation of the air brakes. It is very desirable in all fully inclosed cars, whether of the drop-platform or side-entrance type, to keep the public informed as to how to operate the doors in case of fire or other emergency. To this end, an instruction sign similar to that used in showing the location of air-brake emergency valves (on steam and high-speed electric cars) should be used. Above all, no fuses should be installed under the car seats or at any other point within sight and hearing of the passengers. Recent experiences suggest that fully vestibuled cars should have outwardly folding doors as these can overlap at top and bottom to make a draft-proof vestibule.

Comparison of Prepayment Cars.—Owing to the absence from the platform of both railings and conductor, a fully vestibuled car should load faster and start more promptly than a pay-as-you-enter car unless a comparatively large number of passengers board or leave the latter car while it is in motion. Figures from operation will be found in the chapter on "Accelerating Traffic Movement on the Car."

Another advantage of the vestibuled design is that more passengers will use the front exit, partly because the conductor will try to save himself the work of opening the rear door by exhorting passengers to leave by way of the front door, and partly because the passenger himself will do so more readily as he is no longer obliged to operate any body door before reaching the vestibule door which is operated by the motorman.

The fully vestibuled car is not only more satisfactory from the viewpoints of fare collection and accident reduction, but also for constructional reasons as the absence of doors and bulkheads makes it a cheaper and lighter car to build and thus reduces the cost and weight per seated passenger. Many companies have rebuilt their platform prepayment cars to this type, while others which operate single-end cars have removed the front bulkhead door and even the entire bulkhead. Probably 80 per cent. of all city cars are now fully enclosed.

When the pay-within design first came into use, some ventilating and heating troubles were experienced, but these difficulties are being overcome by using improved automatic ventilation, by small hinged side sash and by extending the doors below platform level to exclude drafts. Double-facing squeegees or window scrapers may be used to clean off vapor and frost from the motorman's vestibule sash.

Near-side Cars.—The near-side car is a variation from the fully inclosed type. It has only one drop-platform, located at the front, and this is used for all entrance and ordinary exit. A rear door with double steps of folding type is used to permit emergency exit from the carbody floor level. The conductor stands either on the platform or in a niche formed between the end of the seating and a hip-high panel at the platform edge. Unlike the pay-within car, the platform is railed for entrance

and exit. The motorman controls all front doors but the conductor commands the emergency exit which is at the rear end diagonally opposite.

The near-side car is very efficient in seating although it was designed chiefly to favor the near-side stop. As a single-end car, also, it has the merit of lower equipment cost and the demerit of less flexibility. The principal objection to cars of this type when as long as 45 ft. is that incoming and outgoing passengers obstruct each other within the carbody. In practice, the inconvenient emergency exit has to be used quite frequently during hours of heavy travel, as people do not care to work their way through the complete length of a crowded car.



FIG. 47.—Philadelphia near-side car.

Side-entrance Cars.—The side-entrance car, although used in Denver and other far Western cities for many years, showed until lately no merits which were considered great enough to warrant its wide adoption. Like the other types it was constructed of wood; the body floor was as high and the steps were less convenient than those on drop-platforms.

The modern side- or center-entrance car is built with steel side girders which are so framed that the floor at the opening for passengers is but one low step from the pavement; further, this opening is much wider than was structurally feasible in wooden cars. The chief merits of the modern car are greatest capacity owing to the absence of platforms, greatest possible length owing to the use of rounded instead of rectangular ends, adaptability for either near-side or far-side stop as only half a car length projects beyond the corner, low step from pavement and the possibility of dividing the seating into compartments for smokers and non-smokers or for white and colored passengers. Passenger movement is effected

in several ways: First, no separate entrance and exit rails as on the suburban lines of Richmond; second, one rail divides incoming and outgoing travel as in New York; third, a central aisle is used for entrance and

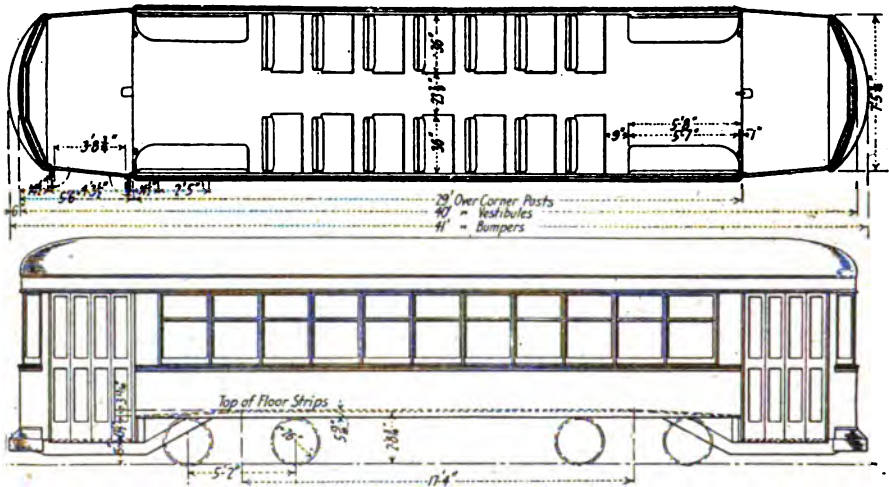


FIG. 48.—Double-end drop platform car with combination seat plan subject to least congestion (Wilmington & Philadelphia Railway).

an aisle on each side for exit as in Brooklyn; fourth, center entrance and exit plus front exit as on Pittsburgh prepayment cars; fifth, the Cleveland door arrangement with front entrance and center exit.

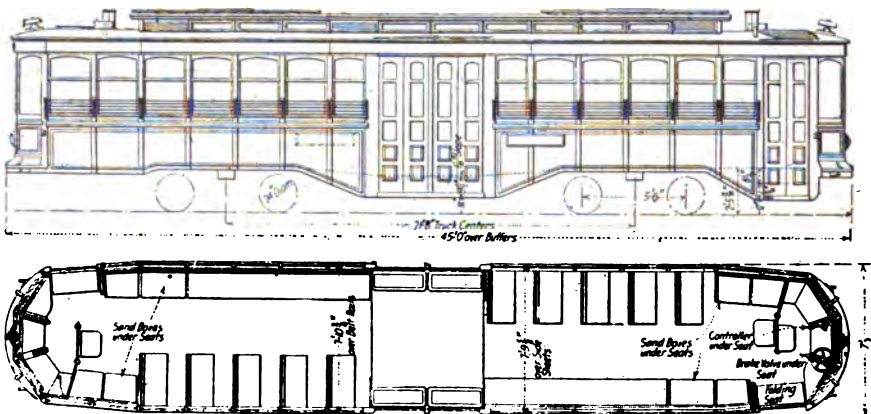


FIG. 49.—Pittsburgh center-entrance, front-exit car.

A few center-entrance cars have a step which folds in connection with sliding doors or folding doors, but in most no step is required because of

the short distance between the pavement and the floor of the platform which is called a "well." The center-entrance car as a type is liable to congestion at the doorway and to the unauthorized use of the exit aisles for entrance. While the congestion is not worse than in other types of cars, some means of effectively blocking or more effectively watching the exit aisles will have to be devised to enable the conductor to get all the fares.

It is desirable that center- or side-entrance cars should have special outside cab doors for the motorman for convenience in throwing switches, setting fenders and wheel guards, etc. The low floor of these cars is also liable to give trouble after a heavy snow storm and where bad paving exists.

The Pittsburgh center-entrance car with auxiliary front-exit (Fig. 49) was the first modification of the plain center-entrance design to be introduced with a view of reducing congestion at a single center doorway. In the Cleveland design (Fig. 50) the end door is used only for entrance

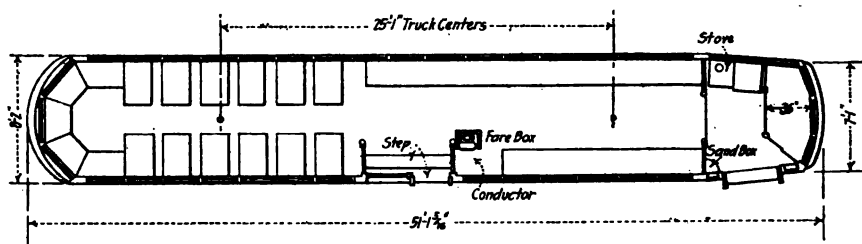


FIG. 50.—Front-entrance, center-exit car (Cleveland).

and the center only for exit. As the conductor is stationed at the exit, the front half of the car can be used by passengers waiting to pay their fare. An account of the fare collection features of this car will be found in Chapter IX on "Fare Collection Practices and Devices."

Articulated Cars.—The articulated, "snake" or "double-breasted" car, as it is variously termed, is a unit composed of two modernized short cars and a center prepayment vestibule used for both entrance and exit. However, there may also be exits at the ends. This type was developed in Boston to simplify operation over sharp curves, to reduce the high platform expense of small cars and to decrease congestion by reducing the total number of units. The articulated car offers an attractive way of increasing the efficiency of small cars, provided that the cost of modernization does not approach too closely the cost of an entirely new car of equivalent capacity.

Double-deck Cars.—The double-deck car, although popular with the English, has never found much favor with Americans. In earlier days a few were built chiefly for pleasure riding. The present revival, which

is also on a small scale, has arisen from the need for a high-capacity car for rush-hour service. In design, the lower deck of the modern American cars is similar to the local company's standards for single-deck cars except in the changes needed to allow stairways. As these double-deckers are of center-entrance type, the stairways are inside. In New York and Washington the same stairways serve for entrance and exit; in Pittsburgh separate stairways are used. The upper decks of these cars are finished more plainly than the lower decks and are used largely by men.

Trail Cars.—Trailers were not formerly designed as such but were merely old horse cars pressed into rush-hour service. The public took a just dislike to them and trail-cars were discontinued in most cities. The modern trailer dates from 1911 when the Pittsburgh Railways brought out a center-entrance design which has proved very popular owing to the low floor obtained by the use of 22-in. instead of the 33-in. wheels used on the higher-step motor car. Since then other companies, as at Montreal in 1913, have built cars for trailer service in which loading is facilitated by using the trailer as a near-side car, so that all entrance is by way of the adjacent rear platform of the motor car and the front platform of the trailer. Modern trailers also have automatic couplers which carry all lighting, heating and door signal circuits. Other points about double-deck and trailer operation are discussed in the chapter on "Accelerating Traffic Movement on the Car."

Division of City Car Areas.—The available area on a car is made up of the platforms and carbody. The small electrified horse cars had platforms which were too short for anything but standing room. As platforms came to be lengthened and vestibuled, some companies undertook to place the motorman, and occasionally the conductor, in separate cabs. This practice added to the car the weight of extra sash and doors, involved extra cost for the buying and upkeep of the trim and took space that could have been applied to aid passenger movement. On double-end cars the cab was made to fold when not in use; on single-end cars the cab was permanent. The fully vestibuled platform, however, gives the motorman ample shelter, while any desired isolation from the passengers can be obtained by means of a railing with the addition, at night, of a curtain which cuts off all reflection from the lights inside. In some cities a part of the rear platform is still railed off for smokers, but the general tendency is to have passengers leave the platform as soon as they have paid their fare. The spare space on cars with long platforms is now furnished with benches which are let down for use whenever the platform is not in service for fare collection.

The changes in carbody seating and aisle layouts show that a much larger part of the available area is used for seats than ever before. In fact, some cars are so crowded with seats that easy passenger movement

is well-nigh impossible during hours of heavy travel. When the average ride was 30 min. or less, longitudinal seating was satisfactory to all, but as rides increased in length the more comfortable cross seat came into wider use. Unhappily, a city car is limited in width by the distance between adjacent tracks so that few companies are able to give wide cross seats and wide aisles at the same time. This condition has led to all kinds of compromises in seating arrangements. The most popular is to use longitudinal seats for two to four passengers each at the doorways and cross seats elsewhere; sometimes longitudinal seats are used on one side and cross seats on the other. On a double-ended car the seating combination is the same on each side of the center line, but the single-ended car has a somewhat higher seating capacity for equal length. In the latter, the cross seats may be continued to the front of the car since people do not leave a car quite so madly as they enter it. As on the platforms, the body has folding seats which are let down opposite such doors as are not in use. On center-entrance cars where no fixed cab is provided for the motorman, circular seats are in place when he is at the other end, and folding seats are lowered alongside the idle center doors.

Reduction of Step Height.—Few single things cause more general complaint than high car steps. The increase in the height of the car step above that of electrified horse cars was an inevitable mate of the increase in the size and speed of the car. With the early motors a height of car floor above the head of the rail of from 36 to 41 in. was necessary to give adequate clearance between the bottom of the motor and the street paving. This distance, when 41 in., was usually divided into three parts, such as first platform step 17 in., second platform step 14 in., and riser from platform into car 10 in. (recommended 1909 Association standards). The excessive height of 17 in. for a step was recognized but it was not thought safe to narrow the platform so as to admit of another step. The dwarf motor permitting the use of smaller wheels helped greatly to solve the difficulty. Even if this motor should cost a little more to maintain on account of its higher speed, it is still preferable, for it is cheaper to build the motor and truck to suit the car than to revolutionize the car for the sake of keeping the bigger, slow-speed motor. Many a standard car can be retained and converted to a low-step design by mounting it on lower trucks with dwarf motors.

The step height of trail cars is no serious matter if no attempt is made to have passengers go from one car to the other. Thus, in Pittsburgh, trailers with 22-in. wheels are hauled by motor cars with 33-in. diameter wheels.

Single-end vs. Double-end Cars.—By a single-end car is understood a car with control equipment at one end only. This necessitates loop

operation except that the direction of the car may be reversed if it is run forward from the main track over one arm of a wye and returned to the main track by running it backward over the other arm of the wye. Thus the car is returned to the track but facing in the opposite direction.

By a double-end car is understood a car with control equipment at both ends. Such a car may be operated to a stub terminal instead of a loop, but this requires changing controller handle and switchiron, shifting of the trolley pole and adjusting of the fender. Then, if double-track operation without loops is used, the car has to be switched over to the other track for the return trip.

The best reason for using the single-end car is that it costs less money; the best reason for using the double-end car is that it gives more flexible service. Equipment economy favors the single-end type in almost all respects, while operating usefulness favors the double-end type.

To elucidate, the single-end car has but one controller, engineer's valve, circuit-breaker, hood switch, fender, etc., whereas the double-end car has two. This saving on the car is offset in part by the cost of land and special work for loops and wyes. If there are no lay-overs at terminals the single-end car will make the better schedule time because it will save at least 30 sec. in changing direction at each end. Loop operation with single-end cars shows its greatest superiority at heavy loading terminals as at park resorts or factory districts. The single-end advocate asserts also that the schedule is better maintained because turn-backs are less easily made.

Finally, the single-end car eliminates accidents caused by passengers coming into contact with the controller, brake handle and other rear-platform equipment through sudden starting of the car. There are also the accidents caused by passengers riding on the left-hand rear step or fender and falling in front of passing cars. These accidents do not occur with the single-end cars. A considerable saving in the cost of special work is also claimed, and it is asserted that the single-end cars made less noise when traveling around the loop track than double-end cars do in passing over frogs and switches at terminals and intermediate crossovers.

As against the foregoing, the operator of double-end cars simply points out that the highest flexibility demands the possibility of turn-backs to meet the exigencies of fire, flood, street reconstruction and other obstacles to through service; that unnecessary turn-backs should be eliminated by proper discipline; that a breakdown at one end will not cripple the car utterly, while a single-end car might break down at an important crossover; that a double-end car can be readily backed up into side streets for handling special traffic as at parks, halls and theaters. Of great importance is the fact that the double-end car makes the crea-

tion of short-trip lines an easy matter, whereas loops or wyes are very hard to get in built-up territory.

It is urged against single-end cars also that they cannot be removed quickly in case of a carhouse fire unless costly through loops had been provided.

One-man Cars.—Among the most hopeful developments in economical operation is the one-man car, now in use on more than 125 roads. The dividing line between loss and profit in towns below 25,000 population and on big city lines of weak or moderate traffic is so thin that the change from two men to one man per car, producing lower platform cost or better headways at less expense, may convert loss into profit. On the small-town properties of the Illinois Traction System such cars have

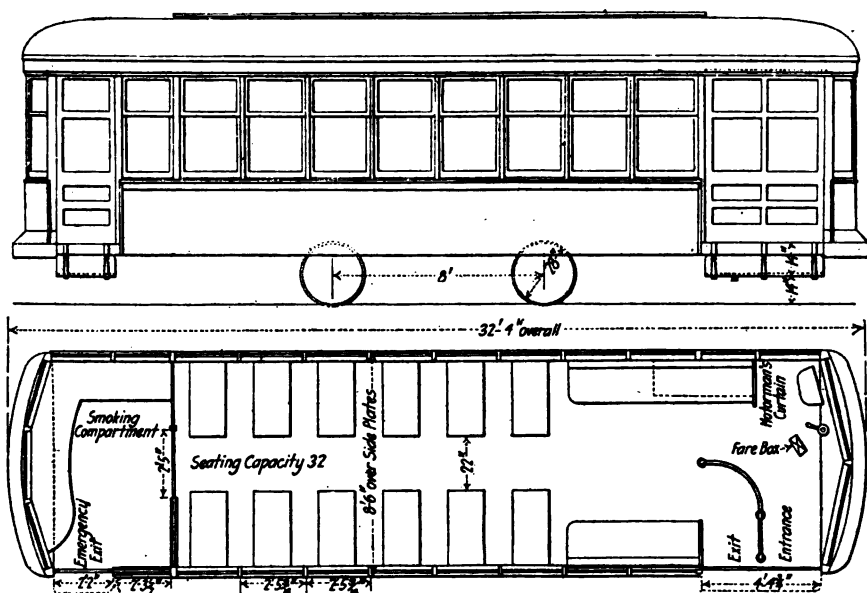


FIG. 51.—One-man two-compartment car for single-end operation (Quincy Ill.).

produced a saving of from 8 to 14 per cent. of the gross earnings. The Illinois Traction one-man cars were among the first to use air-operated doors and steps interlocking with the motorman's brake valve.

The Federal Light & Traction Co. has developed a one-man two-man car of continuous level type instead of building a permanent one-man design. As a one-man car, only the corner doors are used. As a two-man car, or where inspectors are stationed, a side door is available for exclusive entrance and exit or the side door may be used for exit and the front corner door for entrance. This car is illustrated in Fig. 53.

The comparative costs of one-man versus two-man operation have been worked out by the Federal Light & Traction Co. as follows:

TABLE SHOWING OPERATING EXPENSES WITH TWO-MAN AND ONE-MAN CARS
Two-man operation, with a ratio of 75 per cent. single-truck and 25 per cent. double-truck car operation, based on 1,000,000 car-miles per annum

	Way and structures	Equipment	Power	Traffic expense	General and miscellaneous	Total
Per cent. of gross.....	6.0	6.8	10.6	26.0	18.6	68.0
Cents per car-mile.....	1.32	1.50	2.35	6.20	4.50	15.87
Per annum.....						\$158,700

Combined one- and two-man operation, based on 1,200,000 or 20 per cent. increase in car-miles per annum

Per cent. of gross.....	3.76	5.85	4.46	18.45	16.88	49.4
Cents per car-mile.....	0.73	1.15	0.90	3.58	3.25	9.61
Per annum.....						\$115,320
Estimated annual saving in operation.....						\$43,380

The only important objection to the one-man car on light-traffic lines is offered by the requirement that the conductor must signal the

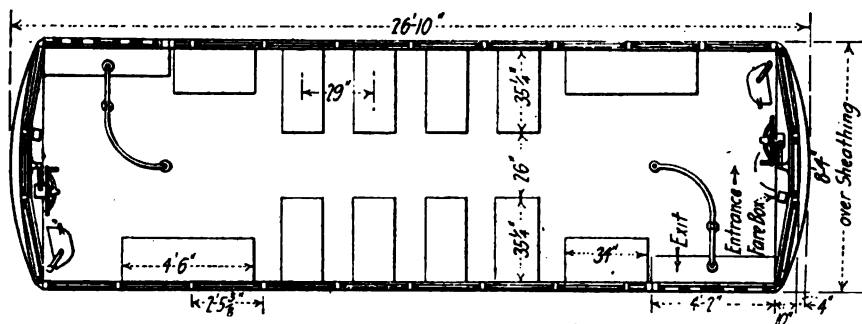


FIG. 52.—One-man car for double-end operation (Albuquerque, N. M.).

car over unprotected grade crossings, but in most cases it will be a great deal cheaper to pay for two or three crossing flagmen than for a dozen conductors. Automatic flagmen are now available also for such conditions and an automatic stop suitable for this service will probably be devised.

Ordinarily, where one-man cars are contemplated the old two-man rolling stock is of antiquated type. The financial and traffic conditions

do not justify modern two-man cars, but one-man operation would probably permit the purchase of high-grade equipment with every device that will make life easier for the operator and safer for the passenger. The manager should explain this to the public through the newspapers and directly to the home commercial club. Let him follow the example of the Wirrona Railway and secure the consent of the citizens before buying the new cars.

When a company decides upon one-man operation, it is desirable that the cars be equipped with every device which will decrease the duties of the motorman-conductor. To help the operator in his duties as a motorman, the car should be furnished with power brakes and automatically operated door, step and sanding mechanisms; and to help him in his

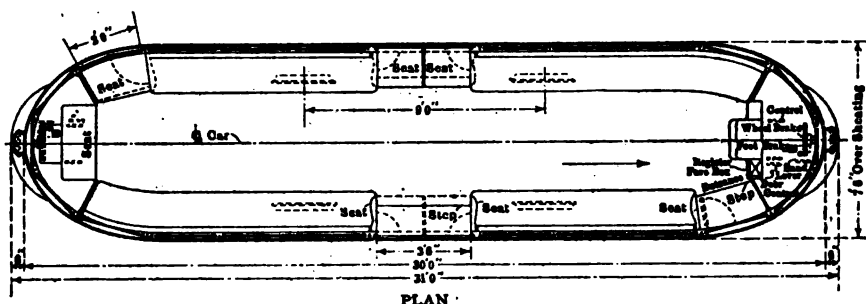


FIG. 53.—One-man two-man car with side door, convertible for double-end operation (Federal Light & Traction Company).

duties as a conductor, it should have fare-recording devices that will reduce the mental effort and time required to make out a trip sheet. The Illinois Traction System has even applied a deadman's handle with an arrangement for opening the rear and front doors in emergencies. A push-button circuit should, of course, be also installed for the convenience of passengers.

Should a railway buy specially designed cars, they could always be transferred to later extensions as soon as the traffic has outgrown the limitation of one-man service. Still, a new car is not needed if the company has some small long-platform cars which can be changed for one-man operation without impairing their possible return to two-man service.

Aside from operation in small towns there are many urban systems where, for one reason or another, the tide of travel is far below that of the main arteries of street railway transportation. Thus, even a densely populated section like the Borough of Manhattan, New York, has a number of short cross-town or stub lines, operated either by storage batteries or horses, which do not earn as much per mile as the average railway in a ten-car town. Here, as in some other places, the only objec-

tion to one-man operation is an ordinance dating from horse-car days. The safety of passengers is actually promoted with one-man cars because every rider enters or leaves via the front under the eye of the operator. Little Rock (60,000), Spokane (104,000) and San Antonio (115,000) are among the larger cities now using one-man cars in part.

New York's battery-car conditions are paralleled in other longitudinal cities where many of the cross-town routes are of relatively little importance. Again, the system seems very suitable for owl cars in large cities. More opportunities for the exploitation of one-man cars appear to exist on the suburban extensions of city lines. In many of the cases where shuttle cars are operated through new suburbs the conductor has no other duties in the home-coming hours than to take up transfers and to watch passengers alight. It is true that he does have to collect fares and issue transfers during the town-going hours, but even then his duties are light because of the small amount of travel. But while the one-man car has its use as outlined, it should not be assumed to be a substitute for the two-man car for lines of heavy traffic.

One-man Car Practices.—One-man cars are usually operated prepayment, but at Lethbridge, Alberta, the passenger drops his fare into a locked box on leaving the car. Transfers, therefore, are also issued on leaving. At Ballarat and Bendigo, Australia, one-man cars are operated prepayment on light days and postpayment on heavy days, thus avoiding congestion at the fare box. The latter has been improved by installing a strip of looking-glass at an angle of 45 deg. in the upper part of the box, which allows the coins to slide past it, and reflects in a horizontal plane the coins as they are dropped upon the hinged plate. Railway managers will appreciate the moral check upon passengers making payments in this public manner. It is possible for a passenger or inspector to sit in almost any part of the car and note what fare has been paid into the box. Formerly this could be detected only by those near the box. At Cape Girardeau, Miss., and Oklahoma City, Okla., it has been found desirable to have a second man permanently on holidays, or to have an extra man ride back and forth on opposing cars within the heavy traffic zone.

City Rapid Transit Cars.—The development of rapid transit routes has been confined in the past only to such very large cities as London, New York, Chicago, Berlin, Boston and the like. The skyscraper construction which has followed even in moderate-sized American cities tends, however, to produce a degree of congestion which can be relieved only by short stretches of subway or elevated lines.

Elevated Cars.—Most of the elevated railway cars in service to-day were originally wooden trailers hauled by steam locomotives. These cars usually had longitudinal seats, with a few cross seats at the center.

The open platforms were so narrow that people could not pass easily if anyone was leaning against the bulkhead or end railing. Electrification was followed by various improvements, such as the widening of the platforms and the use of doors which roll into pockets without sweeping in a radial arc over the platform. Another important change on some lines, as in Boston, was the introduction of center-entrance doors to quicken passenger interchange. On the other hand, some lines adopted cross seats throughout, thus securing more seating capacity but sacrificing the better loading possible with center doors. All elevated cars are operated with third-rail shoes and on some lines, as in Brooklyn, overhead collection is used for operating over surface extensions. There is little to add about elevated cars as a class since the electro-mechanical improvements for other rolling stock have also been applied to them. For example, the latest elevated cars are practically of all-steel construction. With the exception of Liverpool, Europe has no purely elevated railways like those of New York, Chicago and Boston. However, the subway systems of Berlin and Hamburg have elevated extensions over which the underground rolling stock is operated; and the London, Brighton & South Coast Railway operates through South London over its electrified section with first- and third-class cars supplied with well-upholstered cross seats, which are reached through hand-opened side doors and an aisle running along one-half of each side of the car. These cars are certainly more comfortable than our own. The steam third-class trailers of Berlin are very cheap and equally inconvenient.

Subway Cars.—Primarily, cars used for subway service are even more special than elevated cars. Nevertheless, the fact that they are operated under extraordinarily severe conditions as to temperature, acceleration, speed and curves has made them the pioneer users of betterments which have since accrued to the general gain of the electric railway industry. The greater helplessness of passengers in case of fire on subway cars demanded most radical changes in construction, beginning with the copper-sheathed sides of wooden cars and progressing to all-steel vehicles with cement floors and nothing to burn except the rattan of the seats. In fact the high acceleration, great speed, short headway and large number of trains in the New York subway produced conditions which made the invention of better structural, rolling and electrical material a necessity.

Subway service conditions were responsible for three such great improvements as the non-sparking commutating pole motor, wiring all doors of the train into the control circuit so that the doors must be closed before the train can be started, and for the electro-pneumatic braking

system in which the brake valves are operated electrically to insure instantaneous application of the brake shoes on trains of any length.

As on the interurban and suburban cars hereinafter described, the few route combinations permit the use of marker lamps to indicate the destination and character of the train. Tail lamps for giving signals to the motorman of a following train are also used.

The great density of traffic which makes the New York subway so profitable has been responsible for very radical changes in door and seating layouts for subway cars. The first subway cars had no center doors and soon proved unsatisfactory. The original cars were then fitted with center doors and like doors were applied to all new cars. The platforms of these rebuilt subway cars are fully vestibuled and their doors are still operated by hand. The center doors are operated from the guard's station by air. All the seats are longitudinal, those alongside each center

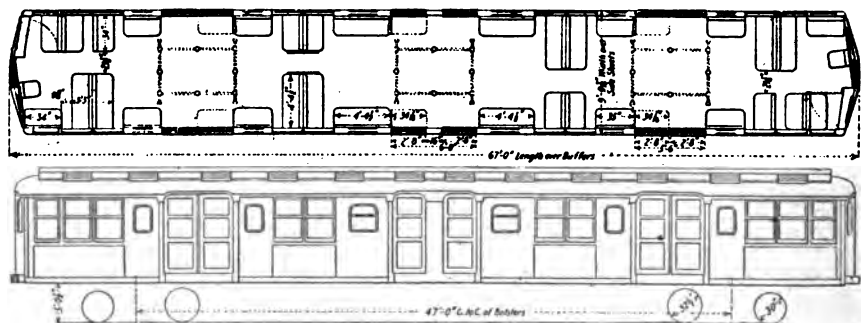


Fig. 54.—Multi-side door rapid transit car (New York Municipal Railway).

door being let down when the door is not required for operation. Movement at the ends has been improved by eliminating bulkhead doors, as in pay-within cars, but end doors are retained to permit passengers to walk from car to car. Such end doors serve to equalize the load for they give the passenger a chance to go to the first or last cars which are usually less crowded.

The side-door and folding seat idea has been carried almost to the limit in the cars recently constructed for the New York Municipal Railway Corporation. Three pairs of air-operated doors are installed on each side. There are no vestibules, and the end-door arrangement does not encourage passengers to walk through the train. The side doors open on free areas with no seating except the longitudinal seats at the opposite doors; the space between the doors, however, is filled with cross seats. During the rush hour all side doors are operated by a guard stationed in the center of the car. Thus, so many passages are provided that the passengers at stations distribute themselves evenly along the

entire train length of the platform instead of "bunching." This car is shown in Fig. 54.

Foreign subway cars are usually more pleasant and spacious than those of America, but far below them in equipment standards. The first cars were of fireproofed wood, but steel is superseding this material. European subway trains, except those on the tube lines of London, are subdivided into second- and third-class compartments. Smoking sections are sometimes used, although in Berlin the operating company would prefer to abolish them because of the fire risk and the confusion resulting in boarding trains with so many subdivisions. The motor cars of the London "tube" lines were built with passage at the rear only, and not until 1912 did the company find it necessary to experiment with center doors to give a second passage. This brief reference to large European cities will suffice to show how much more intensive our own traffic conditions are. The fact that the methods described do not satisfy real rush-hour traffic was observed by one of the writers on the Berlin subway system in the summer of 1909 when the advent of Zeppelin's first airship created some genuinely heavy travel. This was at least one time when even the well-schooled German forgot the brittle nature of glass and the distinction between compartments for democrats and aristocrats.

Suburban and Interurban Cars.—Suburban and interurban cars range in type from a slightly enlarged and heavier city car to a coach with fittings as luxurious as the finest Pullman. Their framing is being changed gradually from wood to steel, but until lately their general design has been altered little because questions of fare collection, step height and quickness of passenger handling were not so influential as in city operation.

The simplest form of car as used on short suburban and interurban lines is merely a somewhat longer and more substantial city car with cross seats and baggage racks in the passenger section. Many of these cars have a small compartment for baggage and express, the same compartment containing folding seats for smokers. The high-speed suburban cars of electrified steam railroads and similar lines are in the same category as elevated and subway cars so far as construction and passenger handling are concerned. They are generally of all-steel construction with a large proportion of cross seating. The fact that operation is over right-of-way of steam railroad width permits more spacious cars than are feasible on city rapid transit routes.

High-speed, long-run interurban cars are 60 ft. to 75 ft. long. As these cars are usually operated singly, a unit for trips of several hours must have more divisions than a steam passenger car. A typical interurban car is divided as follows: Two permanent cabs for the motorman, preferably so located that half of the vestibule is left glazed with clear glass to

give a better outlook to the passengers; straight passenger compartment with plush or leather seats; smoking compartment with leather seats; separate toilets; baggage compartment with or without folding seats. Water coolers, post mirrors, match scratchers, electric fans, first-aid supplies and wrecking tools like jacks and axes are also among the usual appurtenances. Those systems which give a train service also operate straight passenger cars with or without buffet service, dining cars, observation cars, chair cars and, as on the Illinois Traction System, sleeping cars.

In general, the division of floor space does not offer the hard nuts of city service, especially as interurban cars have less restrictions with regard to width and do not have to handle great masses of people rapidly. The location of the smoking compartment is one of the few problems. If it is placed in line with the regular passenger compartment, ladies will object to passing through it when entering the car from the rear; while if the smoking room is at the front, the view of other passengers is obstructed and their noses and eyes are offended. The best plan for end-entrance cars, although uneconomical of space, is to place the smoking room on one side, so that the rest of the car can be entered by way of a separate aisle. Where the smoking compartment can be omitted, however, it should be done if for no other reason than to reduce the weight of the car.

Few interurban cars have side doors with separate entrance to each section, but this plan is growing in favor in the case of new steel cars. One reason for side-entrance construction is increase in seating space; another is the quicker handling of passengers. Other variations are the Stark Electric Railroad's prepayment type (Fig. 86) where passengers enter through a rear end door instead of a rear side door, and the cars of the Cleveland, Southwestern & Columbus Railway rebuilt for front entrance and exit to decrease accidents and increase seating.

The underframing of interurban cars differs from city cars chiefly in the absence of drop-platforms. However, important differences are to be noted above the floor line. The platforms must be fully inclosed, but it would be unwise to fit the vestibule doors of these high-speed vehicles with apparatus which could be handled too easily and quickly by the passenger. Usually, it is necessary for the brakeman or conductor to unlatch a trap-door mechanism before the double steps can be exposed and the doors opened. The double steps are fixed, but an extra folding step can be attached to the lower fixed step for use at landings where the ground is depressed too far below the track level. The combination door and step mechanisms developed for prepayment cars are not used or required for interurban conditions. Only a few interurban railways, like the Philadelphia & Western Railway, have adopted

the praiseworthy practice of placing all station platforms on the same level as the floor of the car.

The sash system of interurban cars often follows high-class steam railroad practice in the use of double-width windows which, obviously, cannot be raised or lowered to such a degree as in street cars. These windows, however, give a wide outlook, and since the cars are operated at high speed an opening of a few inches gives ample entrance for cooling breezes. Such windows are arched with fixed ("blind") leaded glass of any desired colors. The deck of interurban cars is given an effect of roominess by the so-called semi-Empire and Empire designs. In the former, which is more widely used, "the deck headlining is curved down to the deck sill moulding except at the deck sashes where it breaks into flat arches above the semi-elliptic sash frames. In an Empire deck the ceiling is vaulted above each pair of deck sashes."¹ To these types of decks the single arch with mechanical ventilators has recently been added.

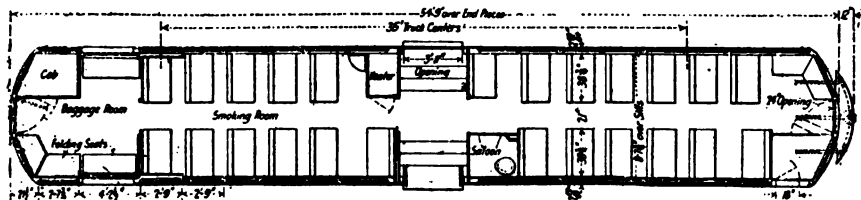


FIG. 55.—Plan of a modern side-entrance car to secure quick passenger interchange on an interurban line with frequent stops (Annapolis Short Line).

In the semi-Empire and Empire styles ventilation is usually obtained through mechanical shutter (louver) type ventilators as it is not desirable on high-speed cars to have direct drafts through deck sashes.

The interior finish is also superior to that of city cars as befits their less intensive use and the higher grade of patronage. Ceilings and panels are often finished in the finest oaks, teaks and mahoganies, the floor of the non-smoking passenger compartment is covered with carpet and the basket racks, door fittings, clothing hangers and other car trimmings are of ornamental bronzes.

The electrical and air-brake equipments, of course, must be equal to or superior to that of the best city and suburban cars. Practically all modern interurban cars have multiple-unit equipment to fit them for train operation.

The air brakes are commonly of the automatic type so that the car or train will stop if any cause reduces the air pressure. The couplers also carry connections for continuing all air control, lighting, signal and other circuits to the succeeding cars.

¹ "Electric Railway Dictionary," 1911 Edition.

Unlike city cars, the sanders are frequently operated by means of compressed air from a by-pass from the air-brake line, so that sand can be delivered with greater certainty and in greater quantity than is possible with the gravity feed used on street-railway cars.

The electric lighting equipment is usually more ornamental inside to match the finish and bare lamps are avoided.

The general lighting system is sometimes reinforced by a small storage battery to avoid dark intervals when the trolley pole leaves the wire, when a third-rail car is crossing a gap at a public highway or when some other disturbance arises. On some interurban cars this battery, instead of oil supply, is used to light marker and tail lamps. It is better, of course, in such lamps not to depend upon the trolley or third-rail current, the very failure of which makes a tail light an absolutely necessary safety measure. Batteries have also been tried for insuring steady headlight illumination.

CHAPTER VI

CITY TIMETABLES—PRELIMINARIES

The importance of the timetable is best explained by the statement that it is the basis used in absorbing anywhere from 30 to 50 per cent. of the total operating expenses. Therefore, the schedule maker is far more important from the standpoint of what he can save or gain for the railway than is the head of any engineering department. Despite this, schedule-making is an infant industry when compared to the development of scientific practices for the way, line, power and car maintenance divisions. While the schedule department is of recent creation, it is already plain that this department is the most potent factor of all in the welfare of the public, the employees and the company.

The Basis of the Schedule.—Before describing the actual making of a schedule it is proper to state briefly the main data which the schedule builder should have before beginning his work. For simplicity's sake it is assumed that the territory has had no railways before or that earlier records are unreliable. Furthermore, such data must be revised from time to time.

Analysis of Territory.—The first points are that of population to be served; the relative locations of the business and residence sections; the working hours and travel routes of each class of workers; the habits of the people as to use of theaters, churches, schools, athletic grounds and parks beyond the walking zone; amount of transient travel for business and pleasure; and the average length of ride per passenger. The timetable man must appreciate that if the average ride is a short one, the public will prefer to walk unless the service is very frequent. We have in mind one route through high-class apartment-house territory which earns 45 cts. per car-mile because the resident along that route could hardly walk a block before having a car thrust at him.

With these data in hand the schedule maker can lay out a first rough draft of headways and car capacity. If the peak load during the work-going and home-coming hours is from 2 to 2.5 times more than during the off hours of the day, he will have a pretty task before him.

With capacity needs known, the next step will be to determine the type of car as to size, seating and standing capacity, ease of entrance and exit, means of fare collection and possible schedule speed.

Knowledge of conditions along the line is also essential before fixing

the headway. It is necessary to reckon with such points as these. Grades, curves, track capacity in the gathering zones, location of car-house, especially as affecting short-line service, width of streets, amount and kind of other vehicles, number of intersections and such heavy delay points as drawbridges, grade crossings with steam railroads; also with municipal rules limiting running speed and specifying stopping conditions. Lastly, certain modifications may be required for passenger connections with other electric or with steam lines and for joint routes where allowance must be made for cars from other lines or companies.

All this research is for but one kind of business day, since very different conditions obtain on holidays aside from the fluctuations due to the weather and season.

Influence of Platform Hours.—Now enters a most vital factor in the making of the table—the distribution of working hours among the platform men. The 14 to 15-hr. swings of horse-car and early electric days happily are no more, but the operator of to-day has not been relieved of the burden of paying a living wage to the extra men who have platform duty only 3 or 4 hr. a day. What other employer of labor is faced by this hard condition? Yet a skilful schedule maker can do wonders in this threefold problem of arranging for the car service required, giving full days' work to the maximum number of men and not overstepping the usually strict limitations of elapsed time for the long time crews. One scheme, for example, is to use the same crews on more than one line, where such lines have their peaks come at different hours.

The schedule finally established, it must be checked from time to time to adjust the service for traffic fluctuations, to correct any conditions that interfere with headways and running time.

The Ideal Timetable Summarized.—The objects of a timetable may now be defined as follows:

To please the patrons by furnishing adequate service.

To please the workers by establishing runs for both regulars and extras within reasonable maximum and minimum limitations of elapsed time.

To please the owners by giving them a little more than current interest on their investment.

Time Elements to be Considered.—In the construction of a timetable certain time elements must be considered, such as running or schedule speed at different times of day, time-point operation, lay-overs, set-backs and short-trip cars.

Running Times.—It is generally agreed that the running time between 7.30 p.m. and 6 a.m. may be speeded up, say, 10 to 15 per cent. above rush-hour figures without danger since slow-downs and stops are greatly reduced between the hours named. It is less desirable to cut the running

time between 9 a.m. and 4 p.m. for wagon and truck travel are then at their height. To try much speeding during these hours is to invite accident.

Many operating men would take issue with the statement that the time taken to make a round trip during rush hours need not usually exceed that during normal hours of traffic. Of course, cars do make more stops during the rush hours than at any other times, but partial compensation is afforded by the fact that the time of passenger interchange tends to be less than it is during normal hours when most of the passengers are children, elderly persons and shoppers who are carrying bundles.

A broader explanation of this paradox is the fact that while the car may lose time outbound it can make up for the loss on its trip inbound. Therefore, comparisons of rush-hour and normal-hour running times should be made on the basis of round trips instead of half trips, because the same car that stops at every corner on its outbound trip when loaded may not have to stop more than three or four times on its return when empty. The stops per round trip, therefore, may actually be less than the stops made by a car during the normal hours when a fairly good load is carried in each direction. Advantage of this cannot be taken to the full, of course, when the cars are held up too long at the terminal or other heavy loading points by slow fare collection, narrow aisles and other hindrances.

After all, the number and time of collisions is a pretty good guide to the justness of a given running time. The men should not be forced to take chances and then be discharged afterward for getting into trouble.

Time-point Operation and Checking.—Time-points are set chiefly to secure uniform loading by maintaining a uniform headway or spacing between cars. But they are also set to aid the motorman to operate according to the most safe and economical speeds. In small cities or any other place where headways are long a rigid time-point system is indispensable. Every motorman should have a timetable and an accurate watch in his vestibule, and be held strictly to account to arrive at a certain corner at a certain minute.

During 1915, under the stress of jitney competition some electric railways gave up this practice in part. It is asserted that no harm resulted and that both speeds and headways were improved. If they did, the service must have been sadly managed before competition came. The fact that instructors were out continually to keep the old men from outrunning the new ones indicates that conditions were far from normal.

When the people know that they can rely upon the street car's arrival instead of waiting indefinitely, they will be much more likely to ride.

within reach of the motorman. As the train comes to a stop, the motorman inserts his card in the clock and secures a record which shows his stopping time at that station. This practice promotes obedience to the schedule over the entire run, prevents unauthorized lay-overs, and insures that crews will go to the very end of the route. Further, it gives a true record of actual platform time.

Automatic checking devices are also available, as on elevated, subway and interurban lines. In one of these, the car on passing an electric contact causes a clock-connected perforator to show when the car went by and in what direction. This record will show: Whether a motorman reversed his car before going all the way to the end of a single-track run; whether the car reached the point too early because of dangerous speed or too late because of dragging the line to get extra fares; whether there was an unusual bunching of cars.

The use of such headway checking devices not only results in more accurate and better running time, but cures dispatchers of turning in theoretically perfect sheets!

Lay-over Time.—In the construction of city timetables the cost of lay-over time should not be overlooked. On a certain line with several terminals the stand time amounts to 40 hr. per day, or more than 14,000 hr. a year. Thus this one item of platform cost foots up to more than \$7000 a year. If stools are provided for the motorman, the lay-over will not be needed merely to give a man a chance to rest by changing his position.

Set-back Operation.—The term "set-back" was defined by the American Electric Railway Transportation & Traffic Association in 1914, as follows:

"By the term set-back is meant the putting out from the terminal of a car the crew of which is to leave on the scheduled leaving time of a car which, through some unavoidable delay, will not arrive at the terminal in time to leave as per schedule. The crew of this car, meeting the delayed car on the line, change cars, turning back the delayed crew so that they will be on schedule time and bringing the other car back to the terminal and thence to the carhouse.

"This method of operation should be discouraged for the following reasons:

"1. It necessitates holding a crew on the bench, under pay, subject to call.

"2. It has a tendency to create indifference on the part of the trainmen regarding the observance of running time. If they know that a turn-back car will be in evidence provided they are behind time, they will not make a great effort to keep on their scheduled time.

"3. It encourages a condition that will eventually have a tendency to slow down the scheduled speed, greatly increasing the platform cost."

While the setting back of cars is one of the necessary evils of street railroading, if it were not employed either the schedule would be completely demoralized or else much time would have to be paid for longer

regular lay-overs to cover possible exigencies. On the other hand, the hustle and bustle in the carhouse which surrounds the assignment of set-back crews and the high rates of pay attached to this work, even for a fraction of an hour, result in the loss of much money. If set-backs cannot be eradicated by a careful study of delay reports, they may at least be controlled. The critical point should be determined at which it is cheaper to extend the lay-over time rather than to pay the high cost of the set-back.

The first requisite in a study of this kind is to have full information as to the extent of the practice. This cannot always be obtained from the data supplied on the ordinary trip register sheet. Many conductors when they make out reports on set-back trips trust too much to their ability to remember the important facts after they return to the carhouse. Others, especially new conductors, are likely to become confused in filling in the data required by this class of service. To overcome this trouble one large company adopted a time card for set-back trips only. It calls for the time of detail and release, the schedule time of the trip, the actual time of starting and return, the place where cars were exchanged, etc. As the set-back card is virtually a time card every minute of expense is accounted for. When a man is assigned to set-back work, the starter gives him one of these cards and notes the time of issue. This means that the conductor has no excuse for not supplying complete information, because he has a card properly headed to show all data. The claim department also benefits by this practice because it is in the possession, for all these regular trips, of regular time cards which are signed and are correct so far as they can be made. With a tabulating sheet the superintendent of transportation can easily determine all the trips which are regularly set back and the average number of minutes which they are late. He may then conduct an inquiry into the causes, and if the schedule is at fault correct it.

Short-trip Cars.—Every schedule maker knows that the short-trip car is a wonderful tool for reducing car mileage and platform expense. He must not go ahead, however, on the basis of traffic analysis alone, but bear these points in mind if his company is to avoid trouble:

First, the number of through cars should not be cut so deeply that passengers are obliged to wait more than twice as long as the minimum rush-hour headway; second, every short-trip car should have its destination marked unmistakably; third, under no circumstances should a street inspector have the authority to make passengers leave at short-trip terminals a car which is marked for a through run. The last practice is an abuse all too frequent, and one which is very exasperating to the passenger.

Even if the short-trip car has been plainly marked as such, the rail-

way must not forget the natural desire of most people to get into the first car that comes along either to get a seat or just to have the gratification of getting onward. Therefore, when possible, a shelter should be provided at the discharge points.

CITY TIMETABLE CONSTRUCTION

Laying Out Headway Sheet.—The first step in the actual making of a specific timetable after the basic data have been gathered is the laying out of the headway sheet. It is begun by taking the carhouse or other point nearest the end of the line which all cars must pass, and putting down the trips in sequence in the column under "Carhouse." This will give the required main-line headway. After the interval between cars operating in one direction from the carhouse is laid out, the trips needed to handle the business in the other directions are scheduled, using the carhouse time and setting the trips back the necessary number of minutes as required by the running time to cover the distance between the carhouse and the terminals from which the cars are to be operated.

A typical city headway sheet is reproduced in Fig. 57. The first column carries the train number, the second shows the time the car leaves its suburban terminus *A* (in this case a point beyond the carhouse *CH*), the fourth when it leaves its downtown terminus *B*, the fifth when it passes an important point on its return *D*, the sixth when it repasses *CH*, and seventh when it returns to *A*. If the line is longer, additional time-points might be found desirable. The blanks in the last column show that certain cars returned to the carhouse instead of completing the full run, while the blanks in the columns marked "A" show that certain runs were started directly from the carhouse.

Horizontal lines divide the figures into groups which are simply arbitrary divisions so that the headway sheet can be cut into pages of coat-pocket size. Such pages are made into booklets for use by station masters, division superintendents and inspectors who are stationed at the passing or time-points.

Examining the headways we find that the interval between cars varies from 15 min. at non-rush periods to 3 min. in the morning rush to 4 min. in the evening rush, except in one case. The reason for the longer headway in the evening is that five two-car trains are then operated, as shown by the superscript "2" on certain train numbers. It will also be noted that some of the two-car trains are not run as such throughout the full length of the route. These two-car trains were put on to relieve congestion on downtown tracks over which it would have been impossible to operate an equal number of cars as single cars. Train operation, of course, should not be used where it would raise the interval between cars of the same route from, say, 4 to 8 min.

Analyzing the figures still further we find that in the 147 min. from 6.12 a.m. to 8.37 a.m. inclusive, thirty-five trips were started with two men each, or seventy men-trips; for the 153 min. from 5.01 p.m. to 7.34

W. LINE WEEKDAY TABLE NO. 2 IN EFFECT Oct. 29 1916

TRAIN	A	CH	B	D	CH	A	TRAIN	A	CH	B	D	CH	A	TRAIN	A	CH	B	D	CH	A
3411	330	338	342	346	350	354	3403	346	352	356	360	364	368	3404	352	358	362	366	370	374
3412	340	348	352	356	360	364	3404	352	358	362	366	370	374	3405	354	360	364	368	372	376
3413	350	358	362	366	370	374	3405	354	360	364	368	372	376	3406	356	362	366	370	374	378
3414	360	368	372	376	380	384	3406	356	362	366	370	374	378	3407	358	364	368	372	376	380
3415	370	378	382	386	390	394	3407	358	364	368	372	376	380	3408	360	366	370	374	378	382
3416	380	388	392	396	400	404	3408	360	366	370	374	378	382	3409	362	368	372	376	380	384
3417	390	398	402	406	410	414	3409	362	368	372	376	380	384	3410	364	370	374	378	382	386
3418	400	408	412	416	420	424	3410	364	370	374	378	382	386	3411	366	372	376	380	384	388
3419	410	418	422	426	430	434	3411	366	372	376	380	384	388	3412	368	374	378	382	386	390
3420	420	428	432	436	440	444	3412	368	374	378	382	386	390	3413	370	376	380	384	388	392
3421	430	438	442	446	450	454	3413	370	376	380	384	388	392	3414	372	378	382	386	390	394
3422	440	448	452	456	460	464	3414	372	378	382	386	390	394	3415	374	380	384	388	392	396
3423	450	458	462	466	470	474	3415	374	380	384	388	392	396	3416	376	382	386	390	394	398
3424	460	468	472	476	480	484	3416	376	382	386	390	394	398	3417	378	384	388	392	396	400
3425	470	478	482	486	490	494	3417	378	384	388	392	396	400	3418	380	386	390	394	398	402
3426	480	488	492	496	500	504	3418	380	386	390	394	398	402	3419	382	388	392	396	400	404
3427	490	498	502	506	510	514	3419	382	388	392	396	400	404	3420	384	390	394	398	402	406
3428	500	508	512	516	520	524	3420	384	390	394	398	402	406	3421	386	392	396	400	404	408
3429	510	518	522	526	530	534	3421	386	392	396	400	404	408	3422	388	394	398	402	406	410
3430	520	528	532	536	540	544	3422	388	394	398	402	406	410	3423	390	396	400	404	408	412
3431	530	538	542	546	550	554	3423	390	396	400	404	408	412	3424	392	398	402	406	410	414
3432	540	548	552	556	560	564	3424	392	398	402	406	410	414	3425	394	400	404	408	412	416
3433	550	558	562	566	570	574	3425	394	400	404	408	412	416	3426	396	402	406	410	414	418
3434	560	568	572	576	580	584	3426	396	402	406	410	414	418	3427	398	404	408	412	416	420
3435	570	578	582	586	590	594	3427	398	404	408	412	416	420	3428	400	406	410	414	418	422
3436	580	588	592	596	600	604	3428	400	406	410	414	418	422	3429	402	408	412	416	420	424
3437	590	598	602	606	610	614	3429	402	408	412	416	420	424	3430	404	410	414	418	422	426
3438	600	608	612	616	620	624	3430	404	410	414	418	422	426	3431	406	412	416	420	424	428
3439	610	618	622	626	630	634	3431	406	412	416	420	424	428	3432	408	414	418	422	426	430
3440	620	628	632	636	640	644	3432	408	414	418	422	426	430	3433	410	416	420	424	428	432
3441	630	638	642	646	650	654	3433	410	416	420	424	428	432	3434	412	418	422	426	430	434
3442	640	648	652	656	660	664	3434	412	418	422	426	430	434	3435	414	420	424	428	432	436
3443	650	658	662	666	670	674	3435	414	420	424	428	432	436	3436	416	422	426	430	434	438
3444	660	668	672	676	680	684	3436	416	422	426	430	434	438	3437	418	424	428	432	436	440
3445	670	678	682	686	690	694	3437	418	424	428	432	436	440	3438	420	426	430	434	438	442
3446	680	688	692	696	700	704	3438	420	426	430	434	438	442	3439	422	428	432	436	440	444
3447	690	698	702	706	710	714	3439	422	428	432	436	440	444	3440	424	430	434	438	442	446
3448	700	708	712	716	720	724	3440	424	430	434	438	442	446	3441	426	432	436	440	444	448
3449	710	718	722	726	730	734	3441	426	432	436	440	444	448	3442	428	434	438	442	446	450
3450	720	728	732	736	740	744	3442	428	434	438	442	446	450	3443	430	436	440	444	448	452
3451	730	738	742	746	750	754	3443	430	436	440	444	448	452	3444	432	438	442	446	450	454
3452	740	748	752	756	760	764	3444	432	438	442	446	450	454	3445	434	440	444	448	452	456
3453	750	758	762	766	770	774	3445	434	440	444	448	452	456	3446	436	442	446	450	454	458
3454	760	768	772	776	780	784	3446	436	442	446	450	454	458	3447	438	444	448	452	456	460
3455	770	778	782	786	790	794	3447	438	444	448	452	456	460	3448	440	446	450	454	458	462
3456	780	788	792	796	800	804	3448	440	446	450	454	458	462	3449	442	448	452	456	460	464
3457	790	798	802	806	810	814	3449	442	448	452	456	460	464	3450	444	450	454	458	462	466
3458	800	808	812	816	820	824	3450	444	450	454	458	462	466	3451	446	452	456	460	464	468
3459	810	818	822	826	830	834	3451	446	452	456	460	464	468	3452	448	454	458	462	466	470
3460	820	828	832	836	840	844	3452	448	454	458	462	466	470	3453	450	456	460	464	468	472
3461	830	838	842	846	850	854	3453	450	456	460	464	468	472	3454	452	458	462	466	470	474
3462	840	848	852	856	860	864	3454	452	458	462	466	470	474	3455	454	460	464	468	472	476
3463	850	858	862	866	870	874	3455	454	460	464	468	472	476	3456	456	462	466	470	474	478
3464	860	868	872	876	880	884	3456	456	462	466	470	474	478	3457	458	464	468	472	476	480
3465	870	878	882	886	890	894	3457	458	464	468	472	476	480	3458	460	466	470	474	478	482
3466	880	888	892	896	900	904	3458	460	466	470	474	478	482	3459	462	468	472	476	480	484
3467	890	898	902	906	910	914	3459	462	468	472	476	480	484	3460	464	470	474	478	482	486
3468	900	908	912	916	920	924	3460	464	470	474	478	482	486	3461	466	472	476	480	484	488
3469	910	918	922	926	930	934	3461	466	472	476	480	484	488	3462	468	474	478	482	486	490
3470	920	928	932	936	940	944	3462	468	474	478	482	486	490	3463	470	476	480	484	488	492
3471	930	938	942	946	950	954	3463	470	476	480	484	488	492	3464	472	478	482	486	490	494
3472	940	948	952	956	960	964	3464	472	478	482	486	490	494	3465	474	480	484	488	492	496
3473	950	958	962	966	970	974	3465	474	480	484	488	492	496	3466	476	482	486	490	494	498
3474	960	968	972	976	980	984	3466	476	482	486	490	494	498	3467	478	484	488	492	496	500
3475	970	978	982	986	990	994	3467	478	484	488	492	496	500	3468	480	486	490	494	498	502
3476	980	988	992	996	1000	1004	3468	480	486	490	494	498	502	3469	482	488	492	496	500	504
3477	990	998	1002	1006	1010	1014	3469	482	488	492	496	500	504	3470	484	490	494	498	502	506
3478	1000	1008	1012	1016	1020	1024	3470	484	490	494	498	502	506	3471	486	492	496	500	504	508
347																				

rush hours are required on this line during the mid-day hours to fill out a day's work.

The running time for the round trip is 58 min. for both one-car and two-car trains. The lower right-hand corner of the headway table shows several early morning trains which do not run to the down-town terminus.

Analysis of Timetable.—The timetable developed from the headway sheet described appears, in part, in Fig. 58. Attention is directed first to the section on the right side ruled with heavy vertical lines. Commonly this is called the "run guide" because it shows the run number of each crew, the on and off number of each crew, the on and off periods of each crew and their total working time. In this case practically all are very close to 10 hr. The choice of runs is on a seniority basis, and even a hasty inspection will show that the older men can break up their day's work quite agreeably. On this table "Out" refers to the time that the car has been pulled out of the carhouse; "In" to the time that the car has been pulled into the carhouse.

Turning now to the left of the timetable we find it ruled in heavy horizontal lines. In the first vertical column of each oblong so made we find the train number which applies to all crews who will handle the same run throughout the day. For example, train No. 3601 will be handled successively by the crews who have runs Nos. 2 and 9; train No. 3605 by those who have runs Nos. 3, 10 and 22, while No. 3612 has those of runs Nos. 10, 18, 17, 11 and 20. The time figures on the table show only the arrival and departure, but the running time between important points is shown elsewhere under "Time-points." The headways regardless of the train numbers are also shown on the table.

The use of large numbers for the run numbers makes it much easier for the men to read the table. Knowing its run number, the crew quickly picks out the corresponding section which shows its time out, what time each half trip must be completed and what time it is to be in or relieved. The "out" as well as the "in" times are not those of the minute of car arrival and return, but 9 or 10 min. earlier and later respectively as indicated on the table, this being run-off and run-on time—meaning the time required between the carhouse and the terminal A.

The headway sheet and schedule described were originated by the timetable department of the Public Service Railway. It has been the recommended standard of the American Electric Railway Transportation & Traffic Association since 1910. It is now used by many other systems, among them being the Bay State Street Railway.

While headway sheets may be cut up into book sheets, complete tables which cannot be treated in the same way can be conveniently reduced, say, from the 19-in. by 30-in. original to an 11-in. by 14-in. print for office reference.

W LINE WEEKDAY...TABLE NO. 2 IN EFFECT Oct. 29, 1916 SUPERSEDING NO. 1

TRAIN	FROM	A	TO	B	VIA	RUN	ON	OFF	ON	OFF	HR	MIN
3601	2	5:00	5:30	5:45	5:55	5:55	5:55	5:55	5:55	5:55	5:55	5:55
3602	7	5:00	5:30	5:45	5:55	5:55	5:55	5:55	5:55	5:55	5:55	5:55
3603	6	5:00	5:30	5:45	5:55	5:55	5:55	5:55	5:55	5:55	5:55	5:55
3604	5	5:00	5:30	5:45	5:55	5:55	5:55	5:55	5:55	5:55	5:55	5:55
3605	3	5:00	5:30	5:45	5:55	5:55	5:55	5:55	5:55	5:55	5:55	5:55
3606	13	5:00	5:30	5:45	5:55	5:55	5:55	5:55	5:55	5:55	5:55	5:55
3607	14	5:00	5:30	5:45	5:55	5:55	5:55	5:55	5:55	5:55	5:55	5:55
3608	12	5:00	5:30	5:45	5:55	5:55	5:55	5:55	5:55	5:55	5:55	5:55
3609	4	5:00	5:30	5:45	5:55	5:55	5:55	5:55	5:55	5:55	5:55	5:55
3610	11	5:00	5:30	5:45	5:55	5:55	5:55	5:55	5:55	5:55	5:55	5:55
3611	1	5:00	5:30	5:45	5:55	5:55	5:55	5:55	5:55	5:55	5:55	5:55
3612	10	5:00	5:30	5:45	5:55	5:55	5:55	5:55	5:55	5:55	5:55	5:55
3613	9	5:00	5:30	5:45	5:55	5:55	5:55	5:55	5:55	5:55	5:55	5:55

TIME POINTS
In Run from CH to CH via X & Y

Car House	8
F	8 16
X	4 20
Y	10 30

TIME POINTS
In Run from A to B

A	9	12
Car House	3	12
D	7	19
C	2	21
B	8	29

HEADWAYS FROM A

3:30 AM	1:24 AM	6	8:03 PM	6
3:45	1:36	4	8:10	7
3:55	1:40	5	8:20	8
4:05	1:45	6	8:30	9
4:15	1:50	7	8:40	10
4:25	1:55	8	8:50	11
4:35	2:00	9	9:00	12
4:45	2:05	10	9:10	13
4:55	2:10	11	9:20	14
5:05	2:15	12	9:30	15
5:15	2:20	13	9:40	16
5:25	2:25	14	9:50	17
5:35	2:30	15	10:00	18
5:45	2:35	16	10:10	19
5:55	2:40	17	10:20	20
6:05	2:45	18	10:30	21
6:15	2:50	19	10:40	22
6:25	2:55	20	10:50	23
6:35	3:00	21	11:00	24
6:45	3:05	22	11:10	25
6:55	3:10	23	11:20	26
7:05	3:15	24	11:30	27
7:15	3:20	25	11:40	28
7:25	3:25	26	11:50	29
7:35	3:30	27	12:00	30
7:45	3:35	28	12:10	31
7:55	3:40	29	12:20	32
8:05	3:45	30	12:30	33
8:15	3:50	31	12:40	34
8:25	3:55	32	12:50	35
8:35	4:00	33	1:00	36
8:45	4:05	34	1:10	37
8:55	4:10	35	1:20	38
9:05	4:15	36	1:30	39
9:15	4:20	37	1:40	40
9:25	4:25	38	1:50	41
9:35	4:30	39	2:00	42
9:45	4:35	40	2:10	43
9:55	4:40	41	2:20	44
10:05	4:45	42	2:30	45
10:15	4:50	43	2:40	46
10:25	4:55	44	2:50	47
10:35	5:00	45	3:00	48
10:45	5:05	46	3:10	49
10:55	5:10	47	3:20	50
11:05	5:15	48	3:30	51
11:15	5:20	49	3:40	52
11:25	5:25	50	3:50	53
11:35	5:30	51	4:00	54
11:45	5:35	52	4:10	55
11:55	5:40	53	4:20	56
12:05	5:45	54	4:30	57
12:15	5:50	55	4:40	58
12:25	5:55	56	4:50	59
12:35	6:00	57	5:00	60
12:45	6:05	58	5:10	61
12:55	6:10	59	5:20	62
1:05	6:15	60	5:30	63
1:15	6:20	61	5:40	64
1:25	6:25	62	5:50	65
1:35	6:30	63	6:00	66
1:45	6:35	64	6:10	67
1:55	6:40	65	6:20	68
2:05	6:45	66	6:30	69
2:15	6:50	67	6:40	70
2:25	6:55	68	6:50	71
2:35	7:00	69	7:00	72
2:45	7:05	70	7:10	73
2:55	7:10	71	7:20	74
3:05	7:15	72	7:30	75
3:15	7:20	73	7:40	76
3:25	7:25	74	7:50	77
3:35	7:30	75	8:00	78
3:45	7:35	76	8:10	79
3:55	7:40	77	8:20	80
4:05	7:45	78	8:30	81
4:15	7:50	79	8:40	82
4:25	7:55	80	8:50	83
4:35	8:00	81	9:00	84
4:45	8:05	82	9:10	85
4:55	8:10	83	9:20	86
5:05	8:15	84	9:30	87
5:15	8:20	85	9:40	88
5:25	8:25	86	9:50	89
5:35	8:30	87	10:00	90
5:45	8:35	88	10:10	91
5:55	8:40	89	10:20	92
6:05	8:45	90	10:30	93
6:15	8:50	91	10:40	94
6:25	8:55	92	10:50	95
6:35	9:00	93	11:00	96
6:45	9:05	94	11:10	97
6:55	9:10	95	11:20	98
7:05	9:15	96	11:30	99
7:15	9:20	97	11:40	100
7:25	9:25	98	11:50	101
7:35	9:30	99	12:00	102
7:45	9:35	100	12:10	103
7:55	9:40	101	12:20	104
8:05	9:45	102	12:30	105
8:15	9:50	103	12:40	106
8:25	9:55	104	12:50	107
8:35	10:00	105	1:00	108
8:45	10:05	106	1:10	109
8:55	10:10	107	1:20	110
9:05	10:15	108	1:30	111
9:15	10:20	109	1:40	112
9:25	10:25	110	1:50	113
9:35	10:30	111	2:00	114
9:45	10:35	112	2:10	115
9:55	10:40	113	2:20	116
10:05	10:45	114	2:30	117
10:15	10:50	115	2:40	118
10:25	10:55	116	2:50	119
10:35	11:00	117	3:00	120
10:45	11:05	118	3:10	121
10:55	11:10	119	3:20	122
11:05	11:15	120	3:30	123
11:15	11:20	121	3:40	124
11:25	11:25	122	3:50	125
11:35	11:30	123	4:00	126
11:45	11:35	124	4:10	127
11:55	11:40	125	4:20	128
12:05	11:45	126	4:30	129
12:15	11:50	127	4:40	130
12:25	11:55	128	4:50	131
12:35	12:00	129	5:00	132
12:45	12:05	130	5:10	133
12:55	12:10	131	5:20	134
1:05	12:15	132	5:30	135
1:15	12:20	133	5:40	136
1:25	12:25	134	5:50	137
1:35	12:30	135	6:00	138
1:45	12:35	136	6:10	139
1:55	12:40	137	6:20	140
2:05	12:45	138	6:30	141
2:15	12:50	139	6:40	142
2:25	12:55	140	6:50	143
2:35	13:00	141	7:00	144
2:45	13:05	142	7:10	145
2:55	13:10	143	7:20	146
3:05	13:15	144	7:30	147
3:15	13:20	145	7:40	148
3:25	13:25	146	7:50	149
3:35	13:30	147	8:00	150
3:45	13:35	148	8:10	151
3:55	13:40	149	8:20	152
4:05	13:45	150	8:30	153
4:15	13:50	151	8:40	154
4:25	13:55	152	8:50	155
4:35	14:00	153	9:00	156
4:45	14:05	154	9:10	157
4:55	14:10	155	9:20	158
5:05	14:15	156	9:30	159
5:15	14:20	157	9:40	160
5:25	14:25	158	9:50	161
5:35	14:30	159	10:00	162
5:45	14:35	160	10:10	163
5:55	14:40	161	10:20	164
6:05	14:45	162	10:30	165
6:15	14:50	163	10:40	166
6:25	14:55	164	10:50	167
6:35	15:00	165	11:00	168
6:45	15:05	166	11:10	169
6:55	15:10	167	11:20	170
7:05	15:15	168	11:30	171
7:15	15:20	169	11:40	172
7:25	15:25	170	11:50	173
7:35	15:30	171	12:00	174
7:45	15:35	172	12:10	175
7:55	15:40	173	12:20	176
8:05	15:45	174	12:30	177
8:15	15:50	175	12:40	178
8:25	15:55	176	12:50	179
8:35	16:00	177	1:00	180
8:45	16:05	178	1:10	181
8:55	16:10	179	1:20	182
9:05	16:15	180	1:30	183
9:15	16:20	181	1:40	184
9:25	16:25	182	1:50	185
9:35	16:30	183	2:00	186
9:45	16:35	184	2:10	187
9:55	16:40	185	2:20	188
10:05	16:45	186	2:30	189
10:15	16:50	187	2:40	190
10:25	16:55	188	2:50	191
10:35	17:00	189	3:00	192
10:45	17:05	190	3:10	193
10:55	17:10	191	3:20	194
11:05	17:15	192	3:30	195
11:15	17:20	193	3:40	196
11:25	17:25	194	3:50	197
11:35	17:30	195	4:00	198
11:45	17:35	196	4:10	199
11:55	17:40	197	4:20	200
12:05	17:45	198	4:30	201
12:15	17:50	199	4:40	202
12:25	17:55	200	4:50	203
12:35	18:00	201	5:00	204
12:45	18:05	202	5:10	205
12:55	18:10	203	5:20	206
1:05	18:15	204	5:30	207
1:15	18:20	205	5:40	208
1:25	18:25	206	5:50	209
1:35	18:30	207	6:00	210
1:45	18:35	208	6:10	211

Other Timetables from Practice.—A typical week-day timetable of the San Francisco Oakland Terminal Railways is that of the Hopkins Street line. In the first place it will be noted that the first column carries nine block numbers. Each block number represents a car, but the time that this car is handled by successive crews is indicated by the run numbers appearing horizontally across the table. The second column shows the time the car of each block number was taken out of the station. The third column shows the terminal, and the following columns except the last show the scheduled leaving times at the terminals known as Thirteenth and Washington Streets and Thirty-fifth Avenue. Spaces are provided over each group of time figures to show when the crews are relieved. The last column, of course, shows time in at car station.

Below the schedule of the Hopkins Street line and its Thirteenth Avenue branch will be found a detailed table of the time-points and running time. The first two sections of this table applying to eastbound trips show the motorman at what minute past the hour he should pass the time-points presented in the center of the table. The last two sections of the table cover the same information for westbound trips. It will be observed that two sets of time-points are used, one corresponding to a 12-min. headway and the other to a 10-min. headway. "No. 1 Fast Time" and "No. 2 Slow Time" at the immediate right and left of the time-points in the center of the table show running minutes between the time-points and total minutes from initial leaving point. "Slow Time" is used when it is necessary to run at a lower rate of speed during the rush-hour period as designated in the last paragraph under "Special Instructions." A comparison of scheduled leaving times and actual running time will show that lay-overs up to 3 min. are provided. At the base of the table synopses are prepared for the convenience of those interested. In this way, a crew can see quickly just what it is expected to do throughout the day. In the table as reproduced only four of the runs are scheduled in this synopsis, but in the complete table all the runs would be scheduled. The rest of the table shows the total car-hours, total cars, total runs, etc.

In compiling timetables the information is arranged for cutting and filing in a uniform manner. On the left-hand margin of the schedule in its original form, circles are used to show where perforations are to be made, and a short line appears at the left to show where the sheet should be cut so that the information will be conveniently divided on all pages of the schedule.

On the Portland (Ore.) system a schedule covering a given line is divided vertically to show the following data in order: Sets of double columns show the starting time from each terminal for the train whose number appears at the top of each column, with time of leaving carhouse.

HOPKINS STREET LINE—DAILY EXCEPT SATURDAY AND SUNDAY—Continued
13th Ave. Branch

	Run No.	305 M. & 314 C.		3.05 M.—		9.46 A.M.—		314 M.		314 C. & M.		Time due on 12-min. headway
		18th St.	11th St.	7.06	7.11	7.16	7.21	5 min. each way	to	6.26	6.31	
9	6.59 A.m.											6.54 P.m.

Time due on 12-min. headway		Time due on 10-min. headway				No. 2 slow time	No. 1 fast time	Time-points + running time	No. 1 fast time	No. 2 slow time	Time due on 10-min. headway				Time due on 12-min. headway																
55	43	31	19	07	59	49	39	29	19	09	0	0	0	0	0	13th & Wash.	7	27	7	29	36	46	56	06	16	26	30	42	54	06	18
02	50	38	26	14	06	56	46	36	26	16	7	7	7	7	7	Cent. Car Sta.	7	20	9	22	29	39	49	59	09	19	23	35	47	59	11
09	57	45	33	21	13	03	53	43	33	23	16	9	14	7	14th Av. & 23d St.	3	13	3	13	22	32	42	52	02	12	16	28	40	52	04	
13	01	49	37	25	17	07	57	47	37	27	20	4	18	4	32d St.	1	10	1	10	19	29	39	49	59	09	13	25	37	49	01	
14	02	50	38	26	18	08	58	48	38	28	21	1	19	1	14th Av. & Hopl.	9	9	9	9	18	28	38	48	58	08	12	24	36	48	00	
22	10	58	46	34	26	16	06	56	46	36	29	8	27	8	35th Ave.	0	0	0	0	09	19	29	39	49	59	03	15	27	39	51	

Synopsis of runs, reliefs at cent. car sta.

300 out 5.15 a.m. block 1, off 2.59 p.m.	hrs. min.
301 rels 300 on block 1 at 2.59 p.m. in 1.10 a.m.	9.44
302 out 6.10 a.m. block 2, off 2.09 p.m.	10.11
4.58 p.m. block 8, in 7.02 p.m.	10.03
314 cond. out 6.59 a.m. block 9 off from 12.08 to 1.46 + turn in at 6.54 p.m.	10.15
314 mot. rels 305 on block 9 at 9.46 a.m. in 6.54 p.m.	9.08

Total car-hours 126.18 inc. 13th Ave. S.

Total cars 9	" " " "
Total runs 13	" " " "

909 supersedes 861 and supplement No. 1116

of May 13, 1915. Time set-back 2 min. from first to last car, except leaving time from car sta. in morning

Special instructions.

On single track inward cars are superior to outward cars.

See rule 72.

Inward cars will proceed on time if the elec. block signal shows clear block.

Outward cars if their regular meet has not been made will wait 1 min. over their time and proceed if signal shows a clear block.

Observe closely rules 253 and 266.

If the electric signals fail, inward cars will wait 5 min.

at meeting points and proceed as prescribed by rule 90. Outward cars if unable to make clearance in time allowed will be governed by rule 87.

Use the No. 2 or slow running time leaving Wash. St. from 5.07 to 6.19 p.m. inc. and leaving 35th Ave. from 4.39 to 6.13 p.m. inc. Otherwise use the No. 1 or fast time.

CONSTRUCTION OF AN OAKLAND (CAL.) TIMETABLE, SHOWING! CARS! HANDLING A GIVEN CAR (BLOCK NUMBER), USE OF TWO SETS OF TIME-POINTS, EXPLANATORY NOTES, ETC.

The columns of assigned regular and tripper trains are continued to the end of the day's schedules. Below these columns the assignment of runs is shown. This states clearly when the crews holding the runs listed are to report, the figures being 5 min. in advance of the time they are to take out their first car of the day. The relief time is also shown, together with the total working hours of the full number of eighteen crews. Below the list of run numbers is some miscellaneous information such as minimum running time between time-points; peak-load points for the use of the conductor; location of private telephones for use in case of emergency; limits within which motormen are permitted to sit; location of toilet facilities (as arranged for by this company); location of all flagging crossings; period in which certain cars will operate as no-stop cars.

The reference to minimum running time is explained by the fact that a little more leeway is allowed during the congested periods than during the off-peak hours, when traffic conditions are such as to permit operation with the least possible delay.

PORTLAND FORM OF TIMETABLE (MT. TABOR LINE)

SATURDAY SCHEDULE No. 3, EFFECTIVE AUG. 1, 1914

11th & Yamhill to E. 88th & Yamhill

Train 1 Carhouse 4.55		Train 2 Carhouse 5.05		Train 3 Carhouse 5.25		Tripper 1		Train 4 Carhouse 5.35		Train 5 Carhouse 5.55	
11-Y.	88th	11-Y.	88th	11-Y.	88th	11-Y.	88th	11-Y.	88th	11-Y.	88th
	5.30		5.40		6.00				6.10		6.30
6.07	6.45	6.17	7.00	6.37	7.15			6.47	7.30	7.07	7.45
7.22	8.00	7.37	8.15	7.52	8.30			8.07	8.45	8.20	8.55
8.40	9.15	8.50	9.25	9.10	9.45			9.20	9.55	9.30	10.05
9.50	10.25	10.00	10.35	10.20	10.55			10.30	11.05	10.40	11.15
11.00	11.35	11.10	11.45	11.30	12.05			11.40	12.15	11.50	12.25
12.10	12.45	12.20	1.00	12.40	1.15			12.50	1.30	1.03	1.45
1.21	2.00	1.38	2.15	1.53	2.30			3.08	2.45	2.23	3.00
2.38	3.15	2.53	3.30	3.08	3.45	Carhouse 4.07		3.23	4.05	3.38	4.20
3.53	4.34	4.08	4.47	4.21	5.00	4.33 5.13		4.46	5.26	4.59	5.39
5.12	5.52	5.25	6.07	5.38	6.22	5.51 6.30		6.04	6.37	6.17	6.52
6.30	7.08	6.45	7.23	7.00	7.38	Carhouse 7.07		7.15	7.53	7.30	8.08
7.45	8.23	8.00	8.38	8.15	8.53			8.30	9.08	8.45	9.23
9.00	9.38	9.15	9.53	9.30	10.08			9.45	10.23	10.00	10.38
10.15	10.53	10.30	11.15	10.45	11.25			11.00	11.45	11.15	12.00
11.30	12.07	13-H.		13-H.				13-H.		13-H.	
		11.55 12.32		12.05 12.42				12.25 1.02		12.40	
Carhouse 12.44		Carhouse 1.09		Carhouse 1.19				Carhouse 1.39		Carhouse 1.10	
19.49		20.04		19.54		3.00		20.04		19.15	

PORTLAND FORM OF TIMETABLE—Continued

Train 6 Carhouse 515	Tripper 2 Carhouse 646	Train 7 Carhouse 545	Tripper 3 Carhouse 616	Tripper 4	Mt. Tabor Owl
11-Y. 88th 550 69th 627 701 732 801 88th 830 905 940 1015 1050 1125 1200 1235 69th 112 144 215 244 315 353 428 501 533 606 638 707 738 807 838 907 936 1007 1038 1109 1140 88th 1217 Carhouse 1253 19.38	11-Y. 69th 717 747 816 646 Carhouse 911 1229 1259 130 159 230 259 330 409 441 514 546 621 653 722 753 822 853 922 953 1022 1053 1121 1151 88th 1228 Carhouse 104 15.00	11-Y. 88th 620 69th 657 731 802 831 88th 900 935 1010 1045 1120 1155 1230 108 69th 145 214 245 314 345 422 454 527 559 636 708 737 808 837 908 937 1008 1037 1108 1135 13-H. 88th 1215 1258 To Owl 19.13	11-Y. 69th 646 717 746 817 847 917 Carhouse 942 1259 129 300 331 403 435 507 540 612 651 723 752 823 852 923 952 1023 1052 1123 1152 Carhouse 1222 14.49	11-Y. 69th Carhouse 350 415 448 520 553 625 657 Carhouse 727 3.37	88th 1258 Park 80th 100 130 200 230 300 330 400 430 500 530 Carhouse 555 4.57

ASSIGNMENT OF RUNS

	Hours Served
Run 1, train 1, 4:50 to 10:43 and 12:28 to 4:52.....	10:15
Run 2, train 2, 5:00 to 10:53 and 12:38 to 5:05.....	10:20
Run 3, train 3, 5:20 to 11:13 and 12:58 to 5:18.....	10:15
Run 4, train 4, 5:30 to 1:08; T'p'r. 1 B., 4:07 to 7:07.....	10:40
Run 5, train 5, 5:50 to 10:52 and 12:1 to 6:30; S. S. T'p'r. 5:00 to 6:45....	10:30
Run 6, train 6, 5:10 to 11:08 and 12:53 to 5:13.....	10:20
Run 7, train 7, 5:40 to 11:03 and 12:48 to 5:12; S.S. T'p'r. 11:00 to 6:22..	10:55
Run 8, train 1, 10:43 to 12:28 and 4:52 to 12:44.....	9:40
Run 9, train 2, 10:53 to 12:38 and 5:05 to 1:09.....	9:50
Run 10, train 3, 11:13 to 12:58 and 5:12 to 1:19.....	9:45
Run 11, S.S. T'p'r. 10, 7:02 to 9:04 a.m.; train 4, 1:08 to 9:26.....	10:20
Run 12, train 5, 10:58 to 1:21; S.S. T'p'r. 5 B., 5:21 to 6:30; train 5 to 1:10...	10:10
Run 13, train 6, 11:08 to 12:53 and 5:13 to 12:58.....	9:25
Run 14, train 7, 11:03 to 12:48; S.S. T'p'r. 11 B., 4:15 to 5:12; train 7 to 1:00; Train 4 to 1:39.....	11:10
Run 15, T'p'r. 3, 6:11 to 9:42 a.m.; T'p'r. 2, 12:29 to 6:33.....	9:35
Run 16, T'p'r. 2, 6:41 to 9:11 a.m.; T'p'r. 3, 4:47 to 12:22 a.m.	10:05
Run 17, S.S. T'p'r. 10, 5:02 to 7:04 p.m.; train 4, 9:26 to 1:00; train 7, Owl, to 5:55 a.m.....	10:30
Run 18, T'p'r. 3, 12:59 to 4:47; T'p'r. 2, 6:33 to 1:04.....	10:20

PORTLAND FORM OF TIMETABLE—Continued

INBOUND		MINIMUM RUNNING TIME	OUTBOUND	
88th St. to 69th St.....	6 min.		13th & Hall to 11th & Yamhill.....	5 min.
to 48th St.....	12 min.		11th & Yamhill to 3d St.....	5 min.
to 39th St.....	14 min.		to Grand Ave.....	11 min.
to 24th St.....	19 min.		to 24th St.....	16 min.
to Grand Ave.....	24 min.		to 39th St.....	21 min.
to 3d St.....	30 min.		to 48th St.....	23 min.
to 11th & Yamhill.....	35 min.		to 69th St.....	29 min.
PEAK-LOAD POINT			PHONES: Water & E. Morrison, Grand Ave. & Morrison, 39th & Belmont and 60th & Belmont.	
E. 6th & E. Morrison Sts.			SITTING DOWN LIMIT: East of Grand Ave. and South of Yamhill St.	
Time from 88th St.....	24 min.		TOILET FACILITIES: Rear of Real Estate Office, E. 88th & Yamhill Sts.	
Time from 69th St.....	18 min.			
Time from 13th & Hall.....	17 min.			
Time from 11th & Yamhill Sts.....	12 min.			

NO-STOP TRAINS:

Commencing with train 5 leaving 11th & Yamhill Sts. at 4.59 p.m. to train 5 leaving 11th & Yamhill at 6.17 p.m., inclusive, all trains and trippers will carry dash signs "No Stops West of 50th St."

Steam road crossing East First and Morrison must be flagged by conductor when regular flagman is absent, 10.00 a.m. to 2.00 p.m. and 7.00 p.m. to 6.00 a.m. Reliefs made at 27th and East Morrison.

MT. TABOR SATURDAY SCHEDULE No. 3.

EFFECTIVE AUG. 1, 1914.

Doolittle Graphic Timetable Layout.—The following analysis, developed by F. W. Doolittle, shows in graphic form the development of a timetable on the basis of data collected during the study of traffic by him while director of the Bureau of Fare Research, American Electric Railway Association. The following quotation is from Mr. Doolittle's book on "The Cost of Urban Transportation Service."

"The applications of traffic requirements, as measured in cars required to cars scheduled, are largely mechanical, but must be supplemented by certain adjustments made in the light of experience to permit of the practical operation of the schedule. A typical illustration, developing a schedule for a single line,¹ will explain the process. The illustration must be followed with important qualifications in mind. Schedule making is too complicated to lend itself to fixed or rigid rules. The location of car-houses, transfer points and traffic hazards are some of the factors that require judicious treatment in each case. The illustration deals only with general principles and only passing reference is made to certain complications encountered in a simplified application.

"Assume as a typical case a line 4 miles long for which the traffic count has been made and for which the normal number of passengers passing a number of points during each 15 min. of the day is accurately known.

"Fig. 59 is a diagram representing, along the horizontal axis, the time of day, and along the vertical axis, distances. The horizontal lines indicate the street intersections at which traffic counts were taken, and the vertical lines divide the time into 15-min. periods. As originally drawn, this figure and the following ones included the

¹ When cars on more than one route operate over the same track for a part of their journey, the case may be treated by considering the track used jointly as a separate line, or by dividing the local traffic over this part of the line between the two routes and then handling each route separately. Before decision is made as to the best method of handling such jointly operated track, it is well to examine the whole of each route separately to see if the controlling points do not occur elsewhere.

entire 24 hr., but for larger scale and simplicity the diagrams reproduced have been abbreviated to include a few hours only. The larger numbers in Fig. 59 represent the number of passengers carried from each point during each 15-min. period, as determined by averaging a number of observations. The smaller numbers (those in parentheses) represent the number of cars required by the standards of service under which the company is operating. It will be noted from figures below the base line that the allowed number of passengers per car varies, the assumed service standards permitting an average of sixty-four passengers in a car seating forty-four during the rush hour, and an average of only forty passengers through the middle of the day or

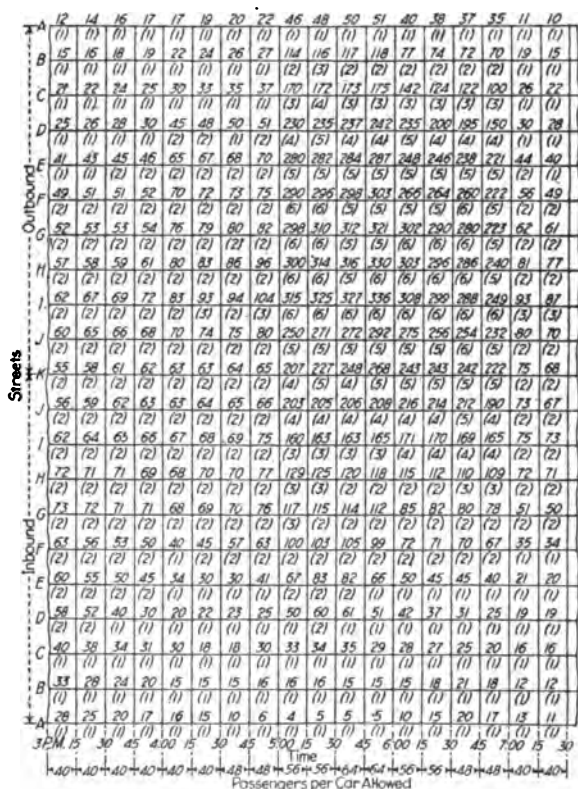


FIG. 59.—Showing passenger traffic at checked streets and numbers of cars required by standards for 15-minute periods (Doolittle).

non-rush period. The standard permits a gradual adjustment of service to traffic during the periods preceding and following the time of maximum loading. The numbers representing the cars required in each 15-min. period were determined by dividing the corresponding numbers by the allowable number of passengers per car.

"Fig. 60 shows in diagonal lines the second step in determining the service to be furnished. The figures inset in the horizontal lines correspond to the number of cars required under the service standards as shown in Fig. 59. The figures at the ends of diagonal lines represent runs, and when the run number is inclosed by a circle the

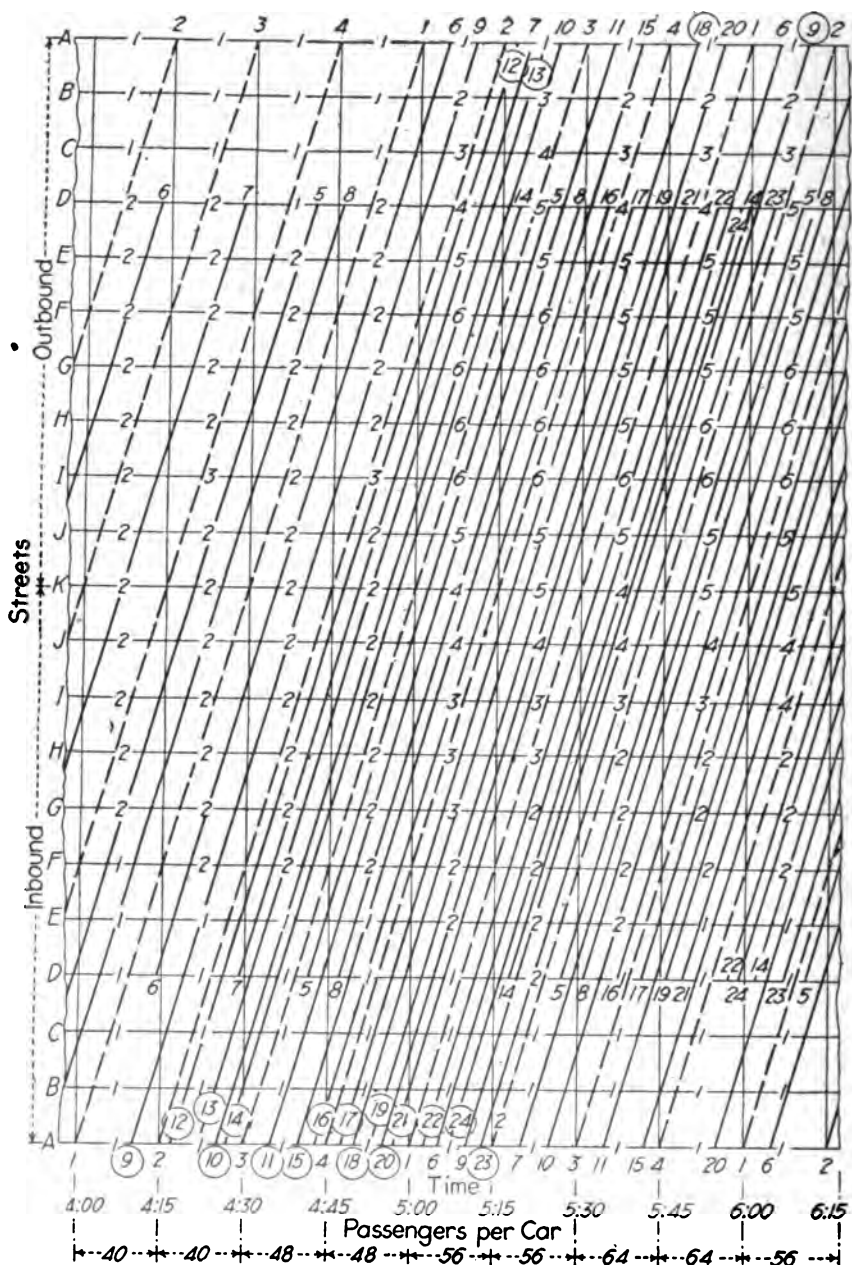


FIG. 60.—Showing number of cars required and number actually operated during 15-minute periods over different parts of route (Doolittle).

run begins or terminates at that time. The dotted lines represent cars run under the assumed requirements that the maximum headway on this line shall be 15 min. Cross-overs are located at Streets *D* and *I* and are used to short-route cars in either direction. From Fig. 59 it is evident that five additional cars must pass Streets *I*, *H* and *G* during each 15 min. from 5 to 5.30 p.m., and these are therefore indicated in Fig. 60. The construction of the schedule is begun at this point, it being here that the maximum traffic demand is found. These cars are scheduled before and after this time to the point at which they are no longer needed and can be returned to the carhouses, which have been assumed to be located at Street *A*. Cars are short-routed at Streets *D* and *I* wherever possible, thus permitting the minimum mileage¹ for the service rendered. Short-routing occurs chiefly at Street *D* both in the morning and in the evening, but also at Street *I* during the morning rush hours.

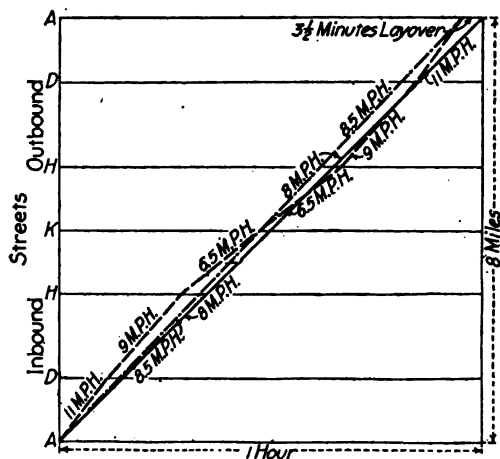


FIG. 61.—Showing relation between average and actual speeds (Doolittle).

"In drawing Fig. 60 an average speed of 8 m.p.h., including lay-over, was assumed as the result of experience. Speed will be different over different parts of the run, and this variation will next be taken into account. Observation and experience, it will be assumed, have indicated that while the run from Street *A* to Street *K* and return, 8 miles, can be made in 1 hr., the average speed between Streets *A* and *D* will be 11 m.p.h.; between Streets *D* and *I*, 9 m.p.h., and between Streets *I* and *K*, 6.5 m.p.h.² The straight diagonal lines of Fig. 60 will then have to be warped and time-points and the final schedule subsequently determined. Fig. 61 indicates how the average speed of 8 m.p.h. is obtained under typical conditions. The schedule thus devised is based on traffic requirements, but modified to take into account possibilities of short-routing, ordinance requirements as to headway, location of carhouses and variable speeds throughout different parts of the route.

"Fig. 62 corresponds to a portion of the graphic schedule shown in Fig. 60 adjusted to meet operating conditions. In Fig. 59 and Fig. 60 the movement of a car from Street

¹ It must be borne in mind, of course, that the minimum mileage here indicated cannot generally be realized completely, as it is unwise to ask passengers to transfer to the car following in all cases where that car normally would have room for them. Some consideration must be given to diversity of traffic, in addition to the consideration already given to this factor in fixing the off-peak capacity of cars at less than the number of seats.

² Variation in speed from hour to hour during the day will necessitate the use of several average and several specific speeds to complete other parts of the schedule.

A to Street K and return to Street A is indicated by a line passing from the bottom to the top of the figure, these extreme lines representing the same street. Fig. 62 is of the type more generally used to represent schedules. In it inbound cars are indicated by lines sloping upward to the right, while outbound cars are represented by lines sloping downward to the right. Although Fig. 62 is the more common form, on account of the difficulty of showing thereon the number of cars required in two directions and the confusion resulting from the many intersections of lines the form used in Fig. 59 and Fig. 60 appears to be preferable for preliminary work. Timetables of the usual types can now be taken off without difficulty, and from the graphic chart the trainmaster can at all times determine the location of all equipment in service and can see most readily the possibilities of expansion and contraction of service as traffic requirements vary.

"No attempt has been made to indicate assignment of crews, as this will depend upon agreements in effect locally as to hours of service and as to the relation between "lay-over" and "running" time. The illustration shows the more important prac-

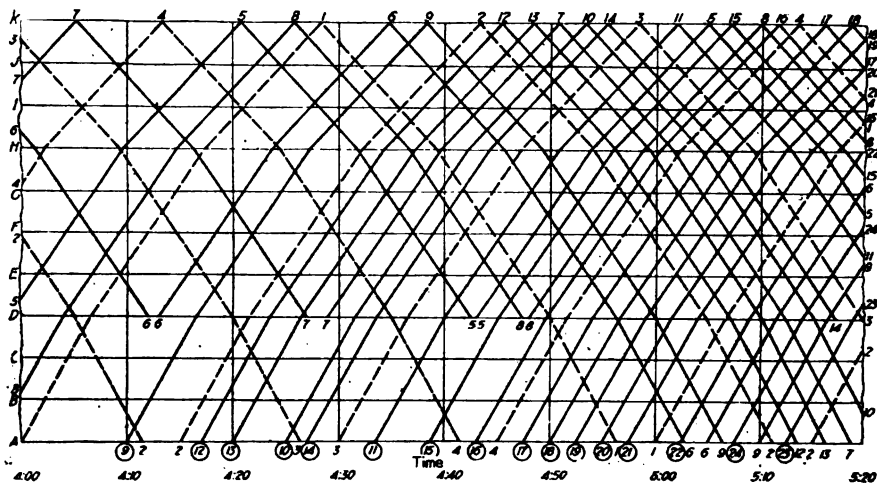


FIG. 62.—Showing in more common way part of graphic schedule previously shown adjusted to meet operating conditions (Doolittle).

tical application of the traffic study, although it should be remembered that in addition to the construction of timetables the traffic study serves as the basis for re-routing of cars, adjusting transfer points and solving similar problems."

Graphical Schedule for City Single-track Lines.—While graphical timetables are common on interurban lines, they have not usually been considered adapted to city railway needs. Nevertheless, if the railway system is not too large, a graphical timetable can be prepared and used to instruct inspectors, starters and even the trainmen themselves how the running time is determined and what affects the time-points. The simplest way of preparing such a timetable is with a board and a string.

The board used should be of well-seasoned soft wood 1 in. to $1\frac{1}{2}$ in. thick, carefully joined and cleated on the back to prevent warping.

The height should be a direct multiple, to scale, of the longest route combination possible. In some cases where there are suburban lines much longer than this a second scale for such routes may be chosen. A good scale for a line length of 5 miles is $\frac{1}{4}$ in. to 100 ft. Where the line exceeds 7 or 8 miles it is desirable to have the track layout extend horizontally. The length of the board depends upon the scale of time chosen. A good value, regardless of the maximum track length, is $\frac{3}{8}$ in. to each half-minute space. For a 60-min. board, the best one for most uses, this gives 45 in. of time space; and by adding to this the space required for the track layout, scales, street names, etc., a total length (or height if used the other way) or from 50 in. to 60 in. is established. The layout should also show all points on the route, such features as steep grades, factories, etc., at which the schedules might be affected by the operating conditions. In this layout the best results can usually be obtained with a ruling pen and inks on a flat white surface. After the layout is complete a number of thin varnish coats should be put on to complete the appearance of the board as well as to protect it.

The procedure of arranging any particular schedule by strings will be facilitated if thumb-tack plugs are used. These plugs are the ordinary brass furniture tacks used in upholstering, and if the receiving holes are of the proper size the tacks can be most conveniently removed and re-inserted. The size of the hole should be slightly smaller than the shank of the tack and not more than $\frac{3}{8}$ in. in depth.

Mileage Calculations from Schedules.—While the mileage of every scheduled car is based primarily on the figures of the starter or dispatcher, it is usually checked by the report of the conductor on his day or register card. This is desirable in view of unforeseen turn-backs and for other causes of short or lost trips. The back of the day card should carry a table of the different trip combinations possible on the given route so that the conductor need only check off his run, leaving the mileage itself to be recorded by the mileage clerk.

One of the larger urban railways of the West is an exception to the general rule since it figures mileage according to the schedule instead of from trip cards. This scheme makes necessary the use of two special forms, one of which is used by the office men and the other by conductors, who turn it in to the office. The latter is a "special switching, additional and lost trip" report. These reports are totaled on the larger office form and turned over to the auditor's office. The total daily mileage is therefore the regular schedule plus or minus extra runs or lost time.

The Brooklyn Rapid Transit System keeps mileage records under three separate headings to show car-miles, seat-miles, and ton-miles, each item having a distinctive meaning in the analysis of operation. The work of every car is recorded each day and a segregation of these unit

Form N. S. 613-A 2026 1-7-15 AS2004

SURFACE DIVISION
TRIPS, CAR and SEAT MILES and CAR HOURS

Line _____ Date _____ 191__

TRIP ROUTES		LINE ROUTE No. 1, from _____ to _____										LINE ROUTE No. 2, from _____ to _____									
No.	Length Miles	Series	Trips	Miles	Series	Trips	Miles	Series	Trips	Miles	Series	Trips	Miles	Series	Trips	Miles	Series	Trips	Miles		
1																					
2																					
3																					
4																					
5																					
15																					
16																					
17																					
18																					
19																					
20																					
Miles by Series																					
Idle Miles																					
Active Miles																					
Seating Capacity																					
Competition																					
Seat Miles																					

DAILY REPORT TRANSPORTATION DEPT.									
_____ DEPOT						DATE _____			
AUDITOR OF RECEIPTS 88 CLINTON ST., BROOKLYN									
Dear Sir: The following miscellaneous service equipment was operated on this date.									
SAND	SALT	SPRINKLERS	SWEEPERS	PLOWS	WRECKERS	SCHOOL (88th)	TRANSFER	PAY	SHOP
Motormen's trip cards have been forwarded to you for each of the cars listed above. Yours truly _____ Enter Car numbers under proper heading. Original to Auditor of Receipts, Duplicate to be filed.									
<i>Depot Master</i>									

Fig. 67.—Depot Master's report on service cars (Brooklyn).

COPY FOR SHOP FOREMAN TO REACH HIM PRIOR TO 7.00 A. M. EACH WORKING DAY BROOKLYN RAPID TRANSIT SYSTEM									
Mr. _____					Division _____		Date _____		
Foreman _____					Shop _____				
Dear Sir: As per mileage basis in effect at present, the cars numbered below will this date be placed over the pits for a thorough general inspection. Mileage made by each car since its last general inspection appears opposite the corresponding car number.									
CAR NO.	MILEAGE	CAR NO.	MILEAGE	CAR NO.	MILEAGE	CAR NO.	MILEAGE	CAR NO.	MILEAGE
Original—To Shop Foreman Duplicate—To Supt. of Equip. Triplicate—To be retained									
Sig. _____									

Fig. 68.—Mileage report to Mechanical Department (Brooklyn).

MILEAGE. Seating Cap.										Wt. Tons	
Date	Mileage	Date	Mileage	Date	Mileage	Date	Mileage	Date	Mileage	Date	Mileage

Fig. 69.—Daily mileage card kept by the depot mileage clerk (Brooklyn).

A. E. & C. Form 186, 500 2-15-D

The Aurora, Elgin & Chicago Railroad Company
DAILY MILEAGE SUMMARY
THIRD RAIL DIVISION

Schedule No. _____

191

Passenger Train Mileage		TRAINS OPERATED																				
		To St. Charles				Bellwood & Chicago				To Aurora				To Elgin				To Chicago				
		Time	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1	5	4	3	2	1
		12 to 1																				
		1 " 2																				
		2 " 3																				
Total		3 " 4																				
Excursion Train Mileage																						
		11 " 12																				
		12 " 1																				
Total		1 " 2																				
Work Train Mileage																						
		2 " 3																				
		3 " 4																				
		4 " 5																				
Total		5 " 6																				
Freight Train Mileage																						
		6 " 7																				
		7 " 8																				
		8 " 9																				
		9 " 10																				
TOTAL TRAIN MILEAGE		10 " 11																				
Passenger Car Mileage		11 " 12																				
		TOTAL																				
Excursion Car Mileage																						
Total																						
Work Car Mileage																						
Total																						
Freight Car Mileage																						
Total																						
TOTAL CAR MILEAGE																						
Motor Car Mileage																						
Half Motor Mileage																						
Coach Mileage																						
Freight Car Mileage, Loaded																						
" " " Empty																						
Total																						

DAILY MILEAGE SUMMARY
Fox River Division

INTERURBAN LINES

Aurora-Elgin Line, - - - - -

Aurora-Yorkville Line, - - - - -

Elgin-Carpentersville Line, - - - - -

Total Interurban, _____

CITY LINES

Aurora City Lines, - - - - -

Riverview Park Line, - - - - -

Elgin City Lines, - - - - -

Total City Lines, _____

Express, - - - - -

Work Car Mileage Elgin, - - - - -

Work Car Mileage Aurora, - - - - -

Work Car Mileage Elgin Int.Lines, - - - - -

Work Car Mileage Aurora Int.Lines, - - - - -

Total Revenue, _____ Total Mileage, _____

Mileage Clerk _____

Fig. 70.—Daily mileage summary of an interurban railway.

mechanical department; daily mileage card (passenger cars of given weight and seating capacity) kept by depot mileage clerk. These Brooklyn forms appear in Figs. 63 to 69.

Mileage Form of Aurora, Elgin & Chicago Railroad.—Two mileage forms of the Aurora, Elgin & Chicago Railroad are reproduced to show the practices in vogue on a road which operates city and interurban lines,

A. E. C. Form No. 30 A-B-N

THE AURORA, ELGIN & CHICAGO RAILROAD COMPANY CAR MILEAGE REPORT

INCREASE SHOWN IN BLACK
DECREASE IN RED

Month of _____ 191__

LINE	One Month This Year	One Month Last Year	Increase Decrease	Months This Year	Months Last Year	Increase Decrease	TRAINS OPERATED					
							THIS YEAR		LAST YEAR		INCREASE	
							Trains	Cars	Trains	Cars	Trains	Cars
BETWEEN WHEATON AND CHICAGO												
Third Rail												
Passenger												
Freight												
TOTAL												
Pox River Division												
Aurora-Elgin												
A. V. & M.												
Wheaton-Chicago												
TOTAL												
City Lines												
Aurora												
Elgin												
Pox River Park												
TOTAL												
CARS PER TRAIN THIS YEAR												
BETWEEN WHEATON AND AURORA												
Total Passenger Mileage												
Freight and Express												
Third Rail Freight and Exp.												
Pox River Express												
TOTAL												
Total Service Mileage												
Work Trains												
Third Rail Work Trains												
Pox River Work Trains												
TOTAL												
CARS PER TRAIN THIS YEAR												
BETWEEN WHEATON AND ELGIN												
Grand Total All Mileage												
CARS PER TRAIN THIS YEAR												
METROPOLITAN EQUIPMENT USED												
TOTAL MILEAGE THIRD RAIL DIVISION												
Passenger Motor												
Work Motor												
Half Motor												
Cowh												
A. E. & C. Freight Cars												
Freight Freight Cars												
TOTAL												
TOTAL MILEAGE POX RIVER DIVISION												
Interurban												
City												
Express												
Work												
TOTAL												
TOTAL ALL DIVISIONS												

Mileage Clerk

FIG. 71.—Monthly mileage comparison by divisions of Aurora Elgin & Chicago Railroad.

both passenger and freight. The reports, Figs. 70 and 71, show the mileage summaries for each class of operation, train length and division.

Traffic Receipts from Schedules and Trip Cards.—A graphic as well as numerical record of daily and Sunday receipts and receipts per car-hour should be kept by the timetable department for each route and division so that comparisons may be made easily between the business of current days and that of corresponding days of earlier years. Records of single holidays are likely to fluctuate too much to be worth graphic

comparison. Traffic records in general are discussed under "Traffic Analysis." Different colored inks or different kinds of lines may be used for distinguishing most readily the records of several years. Preferably these records are bound in a loose-leaf file.

A re-capitulation sheet may be made for each timetable issued to give the cars, headway, miles, hours, platform and other costs and schedule speed of both the present and preceding tables with the increase or decrease in each item. These figures are also tabulated on larger sheets showing all the routes on the system, thus bringing the important data regarding all the routes together where they may be studied and compared.

On some railways data of this kind are furnished to all division superintendents and other officials responsible for car service and platform labor. Such distribution of data does not seem to serve any good purpose unless it be to spur these men to show lower costs than others when conditions may not be at all comparable. The immediate responsibility for altering service except in emergencies should be with the chief of the timetable department because he is the only official who understands best the relative needs of the system of a whole.

Dispatching Practices.—The usual way of dispatching cars is to send them out of the carhouse under the orders of a depot master, starter or dispatcher. Thereafter, the movement of cars is supervised by line and terminal inspectors; although at important traffic points, cars may be dispatched as rigidly as from the carhouse. The latter practice is seen at its best in the street booth dispatching of the Boston Elevated Railway. This company has a booth on Commonwealth Avenue which houses one man. The front and both sides are provided with windows, allowing a wide range of vision for the individual inside. A telephone has been provided connected with the division headquarters in which the booth is located, and such light equipment as may be required for use in emergencies.

The man on duty is provided with stool and writing shelf, and he maintains a train sheet showing by routes the exact arrival time of cars throughout the day at this important junction point. He is provided with two switches which control red signals suspended from the trolley-pole arm on the two converging tracks on Brighton and Commonwealth Avenues. He can thus hold cars which have arrived ahead of schedule or can properly space cars so that they will alternate on the main line. This is of great value at the in-town terminals, for a great deal of public criticism can be avoided when cars to different destinations are properly alternated, instead of running in groups to the same destination. Such a complete record of car movements approaches the long-established station or dispatcher's records of the steam railroads and obviously can be

of service to the claim department, as well as of value to the transportation department in remedying defects in the service and refuting untruthful condemnation of its service.

While opportunity does not always exist to control all lines at strategic points, wherever it does exist it should be the aim of the up-to-date railway to adopt such efficiency methods. Cars are started on time from their respective terminals, or if they are not there is no excuse for such failure. If, then, at some strategic junction point or points they may again be checked and by means of some control signal can be started over again if they are ahead of time, a great deal of the demoralization of the service can be prevented.

On any heavy line each motorman is likely to have his own views as to the operation of his car to fit street and traffic conditions. The initial half of inbound trips is usually light because the cars are operated in the more sparsely settled territory. If, then, a certain percentage of the motormen on the line make a practice of meeting the congested conditions on the in-town end of the line by running ahead of time over the initial section, they simply aggravate the trouble in that section by unbalancing the traffic load, skipping passengers they should have taken, delaying the following cars and creating the not uncommon condition of bunched cars.

Centralized City Dispatching by Telephone.—It is a strange fact that with the exception of the Denver Tramways the value of the telephone for the general dispatching of city cars should have gone unappreciated so long. In addition to the company named, the San Antonio Traction Company and the New York State Railways—Rochester Lines—may be mentioned as extensive users of the telephone for dispatching.

Despite the small number of existing installations, enough experiences are available to make out an excellent case for dispatching by telephone. Furthermore, its advantages are felt in other ways than closer control of cars and carmen. While the practice followed varies somewhat in detail, the following discussion of what telephone dispatching can do is intended to apply to its use in general.

Transportation Uses.—The primary object of telephone dispatching, of course, is to control the movement of cars from point to point from a central dispatching office instead of leaving them subject only to street inspectors after they have left the car station. Car movement is directed by the policy of the management expressed through the dispatching office—not by the diverse opinions of division superintendents, station masters, roadmasters or street inspectors or even by the conductors themselves. The degree of supervision depends in a measure upon the distance between the pole boxes from which the crews report to the dispatcher for orders. Ordinarily, such boxes should be placed at important inter-

sections, at short-line ends, at turn-back points, at terminals and at railroad or canal crossings where delays may be expected at almost any time. Of course, they should not be installed where reporting would cause needless delays. The very habit of telephoning several times a day will encourage the men to use a foreign telephone if they are stranded too far from one of their own boxes.

The objections have been raised that this system will do away with written schedules and make the dispatcher the autocrat of the system. These consequences need not follow in practice. The basic schedule can still be a written document prepared by the schedule specialist, but it is now an elastic article which can be stretched or compressed, as conditions determine, to give the standards of service set by the management. The dispatcher marks on the written schedule before him any deviations from the orders thereon so that the schedule shows exactly what was done just as it would do without telephone dispatching. Doubtless, increasing experience with telephone dispatching will avoid some present clerical work.

With regard to the powers of the dispatcher, it may be said, that he is simply the mouthpiece of the management or schedule maker; except that he is credited with using on all lines the car-control powers usually granted to traffic men of equal or lower rank than himself.

Fewer Inspectors and Better Supervision.—One of the most obvious advantages of telephone dispatching is that it calls for fewer inspectors and yet permits better supervision.

The reason is that the platform men call up the dispatcher for many purposes otherwise cared for by road inspectors. This relieves the inspectors of the responsibilities of dispatching and gives them more time for their other important duties such as observing the conduct of trainmen and checking register readings. Furthermore, the inspectors themselves are now under supervision. No longer need they be lost to sight all day, for they are ordered to telephone their whereabouts every hour or so. This sensible practice is followed in New York on a road which has no general system of telephone dispatching. Its great advantage is that the inspectors can be readily shifted about or concentrated as traffic conditions demand.

Less Mileage, Lower Platform Cost.—The economy of short-line cars is undisputed, but it is rather a delicate task to entrust their operation as such to the judgment of conductors or petty officers. Only the dispatcher has all the data on the position and loading of following cars. Therefore he is the best judge to decide whether a practically empty through car should be short-lined or whether a well-loaded short-line car should be through-lined.

Then, too, the dispatcher may turn back cars quickly in case of blockades and prevent additional cars from being sent out.

Again, through having all lines under his eye, the dispatcher can make rapid adjustments to meet fluctuations in service. The travel due to a fire, a mass meeting or other unusual event may be handled merely by pulling cars off of other lines which do not need them.

This ability to sense every variation in travel must certainly lead to reduction in car mileage and platform expense on one side; and to increased gross earnings on the other side.

Improved Headways, Schedules and Service.—It is evident that telephone dispatching must improve the headways, the schedule and the continuity of service generally. In any event, each pole box becomes a time-point to which the crews naturally try to adhere, thus holding to the prescribed headways. By the very act of reporting the men always get standard time from the dispatcher, thus securing an important service and safety check. Even headways are particularly hard to maintain after a blockade as every motorman is anxious to make up time. The disadvantages due to car clustering can be prevented by the dispatcher. He can order the delayed cars to return to their original spacing, taking whatever steps are necessary to cancel a number of following cars.

The same control over every car makes it easier for the dispatcher to inaugurate shuttle operation to prevent an utter breakdown of service on opposite sides of an obstruction on the line; to re-route cars temporarily because of parades, floods, etc., and to return set-back cars to schedule. He can even order a uniform decrease in running time when rails are slippery, so that the voluntary action of the cautious motormen will not disturb the spacing of the cars behind them.

Better Handling of Accidents.—On lines without telephone dispatching, the men rarely know how to use a telephone. Therefore, when they become involved in an accident this ignorance plus their excitement leads to some sadly incoherent messages to headquarters. But on a road equipped with telephones, the men have been trained how to use them. As a rule, too, they will not have to use a telephone of the city exchange, but can get into touch with headquarters without asking or waiting for a number. Many a precious moment is saved thereby. Help can be rushed to the spot, an experienced claim man can arrive in time to interview witnesses, the crew may be relieved quickly and other measures taken to clear up an unpleasant situation. It is obvious, also, that by means of the telephone a sick platform man can be taken off in the least possible time.

The Public Pleased.—It has already been brought out how telephone dispatching can improve the service in regard to schedules, headways, short- and through-routing, blockade and parade re-routing, etc.

A telephone dispatching office can also assist the traffic bureau by keeping in touch with the traffic needs of the big industries. The dispatcher or bureau can inform the employer at once of any delays on cars serving his works. On the other hand, the employer can keep the railway informed as to changes in the number and working hours of his men so that service adjustments may be made accordingly.

In like manner, telephone dispatching can speed the provision of service for ball games, concerts and other events which produce irregular and short but heavy travel.

There are other respects in which telephone dispatching leads to public satisfaction. One of these is the quicker and more satisfactory handling of complaints as to service. When a complainant calls up it is the dispatcher's office which knows to a certainty what service was given past the place named—the actual passage of cars, not the figures shown on a schedule prepared days in advance. The estimate of time made by a person when not consulting a watch varies so much with weather, disposition and surroundings that a complainant may readily confuse 10 min. with 5. Not all schedule complaints are fanciful, so where need be they should be passed on to the proper executive for action.

Discourtesy is a common complaint. It is more easily handled with justice when the platform man's side can be obtained while the case is still warm. For example, an offended passenger might call up the complaint department on leaving the car. Within 10 min. headquarters would be in touch with the trainman. The disciplinary value of such a quick follow-up must be very large. But the telephone method also saves the innocent car man from super-excited kickers for it has often established the fact that he could not possibly have been on the car in question.

Another advantage of telephone dispatching is that it gives a short cut to the return of lost articles found by trainmen. As the men are instructed to report and describe all finds at the next box, the loser will be saved all worry as soon as he calls up the railway.

Some Other Advantages of Telephone Dispatching.—Because of the ease of reaching any car on the line, the dispatching system also permits control of all snow, work and emergency cars. The former can receive orders direct or via the crews of passenger cars, while the latter save mileage by calling for the place they should go to next instead of returning to headquarters, or the nearest station of the company.

Another by-product of telephone dispatching is that crews are more inclined to tell about car defects by telephone than they would be by writing. Furthermore, they will be just as willing to mention a dangling span wire or bad rail joint.

Conclusion.—It is the writers' belief that telephone dispatching in

city service has a fine future. The training of the rank and file to use the telephone, and of educating road inspectors to become switchboard operators can hardly be called insuperable difficulties. The one real problem is to lay out economically a network of purchased or rented instruments. Changes in schedule make-up, crew relief and division of responsibilities will become necessary, due to the introduction of telephone dispatching, but the transportation department will doubtless adjust itself to them without any violent effort.

CHAPTER VII

INTERURBAN SCHEDULES AND DISPATCHING

Schedule Layout for Single-track Lines.—In making a schedule for double-track lines it is usually unnecessary to plot a timetable of the service. In single-track operation, however, such a chart or graph is necessary.

Among the points which must be cared for by the schedule maker on interurban lines are the following: that there should be a certain number of limited and a certain number of local trains (usually in equal numbers and run in alternation); that the trains from opposing directions should meet at specified passing points, while maintaining an economical and satisfactory rate of speed throughout their runs; that the trains should also reach certain junctions and terminals at times, which permit connection with connecting steam, electric or boat lines; that lay-overs for trainmen's meals be provided; that provision be made for extra trains, freight, work and passenger; and, most important, that riding be analyzed to determine the possible improvements in through and short-line service.

Laying Out a Graphic Schedule.—The layout of a graphic schedule and particularly the location of passing points in addition to regular passenger stops is a problem that differs, of course, on every line. The following description, however, will serve to show the procedure usually followed in laying out such a schedule:

On a piece of cross-section paper write at the left in vertical order all stations and passing points on the line at spaces proportional to the distances in miles between the points. Thus, in the mythical schedule reproduced in Fig. 72, Rome is one terminal and Seneca the other. If the schedule has many trains the names may be repeated in the center and at the right.

Next mark off the hours of operation along a horizontal line from the right of the list of stops and passing points. The divisions may be in hours or fractions of an hour as may be most convenient.

Assume now that the trains are not started from the Rome terminal but from the carhouse at Brutus Junction. Therefore the diagonal which will show the course of a train must be drawn from the horizontal line representing Brutus Junction and at a point therein corresponding to the time. In the present example, it is indicated that the train was ready at 5.30 and left at 5.40. We now begin the series of diagonals

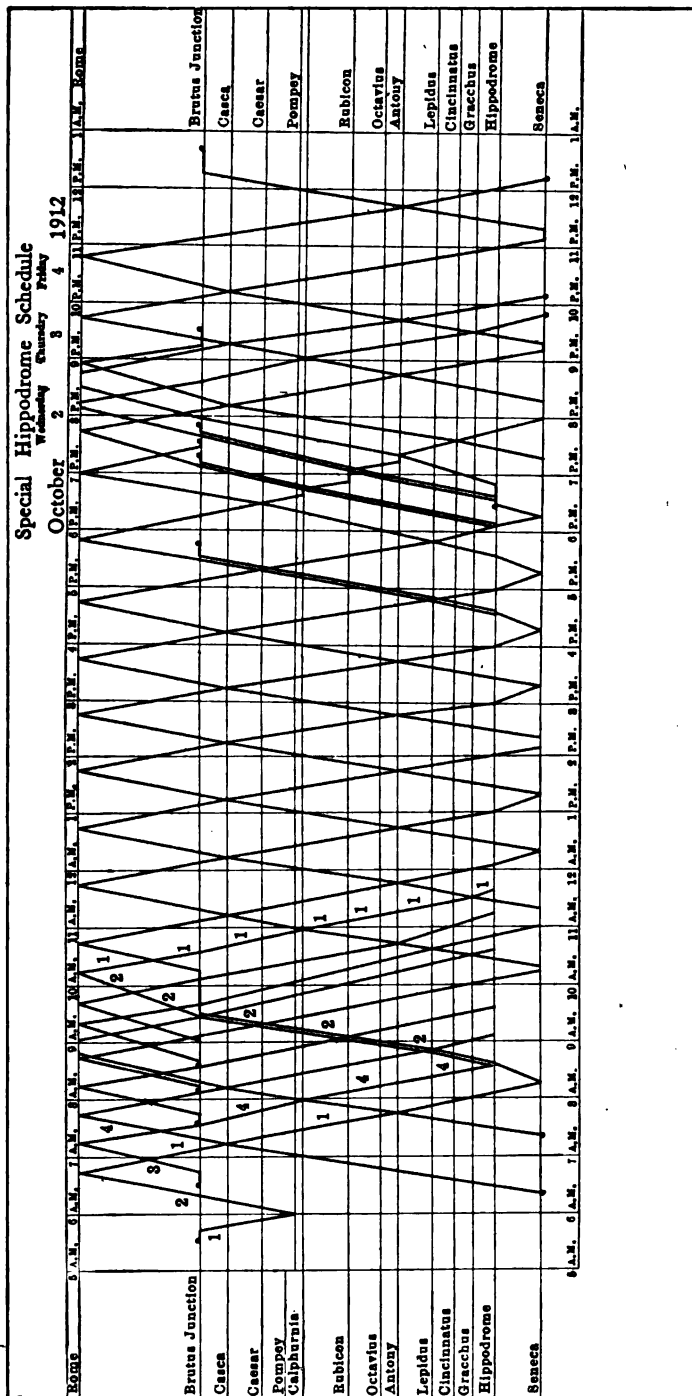


Fig. 72.—Graphic schedule for single-track line.

to show the run of this first train. For convenience in reading, the train number may be repeated throughout the table.

Train No. 1, therefore, has left but instead of going to the nearest terminal at once it makes a run to Calphurnia Junction, via Casca, Caesar and Pompey, reaching it at 6 a.m. to pick up passengers from another line who want to go to Rome. The schedule speed of the train, of course, is equal to the distance from Brutus to Calphurnia Junction divided by the running time. It will be seen that if train No. 1 had started earlier to reach Calphurnia Junction at 6 a.m. its slower speed would be indicated by a less acute diagonal. Therefore, since the inclination of the diagonal depends upon the schedule speed a glance at a graphic table shows the fast and slow trains at once and also all sections where the regular rate of speed is changed. This fact will be apparent enough on scanning the schedule as a whole, wherein the frequent parallelism of the diagonals, and therefore the like speed of the trains, is evident.

To return to train No. 1. Having left Calphurnia Junction it now retraces its course as No. 2 and reaches Rome at 6.45 a.m. As this is the first train of the day it has no meets until after leaving Rome. About halfway between Rome and Brutus Junction it meets and passes, via siding, train No. 3 which has left Brutus Junction 1 hr. later. Continuing it meets the 6.15 train out of Seneca at Casca and the 7.15 train out of Seneca at Antony. Seneca is reached at 8.15 a.m. As this train returns to Rome it reaches the Hippodrome at 8.30. Here it picks up a train which had left Rome at 7.15 and goes only as far as the Hippodrome, and both continue toward Rome. The double diagonal between Hippodrome and Brutus therefore means either that both trains have been coupled to run together or else operated separately on the "car-following," "double-header" or "second-section" plan. In other words an opposing train must wait until both sections have passed it although for safety such sections may be several miles apart. When the double-header reaches Brutus Junction at 9.30 one train (car) is laid off for 45 min. while the other proceeds to Rome. No. 1 train now returns toward Seneca but goes no further than Hippodrome since this is excursion traffic. The other runs can be traced on the chart.

It will be seen that during the morning and evening hours the train service is much more frequent than during the middle of the day. As a rule, also, most of the meets are made without lay-overs but the 5.50 train from Rome to Seneca has three lay-overs of which two are due to waits to make the meets with opposing trains.

Of course, the foregoing description has shown a completed condition as to meets, speeds, etc. In practice the diagonals representing the trains must be shifted back and forth to get the desired combinations, and this is often a labor of days. A favorite way of doing the experi-

menting is to use tacks and colored threads, as described on page 161, instead of drawing and frequently erasing the diagonals.

Naturally, if the passing points occur exactly at the sidings no further study would be necessary. However, the schedule maker, almost invariably, must provide for certain decreases or increases in speed to permit perfect meets or he must provide lay-over time at certain points for meals, etc.

Hourly Schedules vs. Lay-overs.—The general practice of operating cars in both directions at intervals of even hours, making the leaving time from one or both terminals on the hour, is undoubtedly the outgrowth of the development and extension of interurban lines from suburban and city lines. No one will deny that the convenience to the public which an hourly schedule affords has been a large factor in building up interurban traffic in competition with the irregular schedules of parallel steam roads. It is coming to be a question of careful consideration, however, whether regularity of schedules, because it is a traffic-producing asset, is not being maintained at the expense of excessive lay-over time and other objectionable operating practices such as trains running late and the uneven loading of trains.

On city systems the lay-over time has been found to average 12.5 per cent. of the total service time. The percentage is much higher on many interurban roads. One road in New York State, for example, runs from terminal to terminal in 1 hr. and 28 min. with 6 min. lay-over at one end and 57 min. at the other end. The ratio of lay-over time to total time for a round trip is therefore 26 per cent. It seems reasonable to suppose that if only 6 min. lay-over is necessary at one terminal a large reduction could be made at the other terminal provided an irregular schedule was adopted.

This raises the question as to what is the minimum lay-over time necessary for an interurban car crew on a run of, say, 40 miles. The crew must report to the dispatcher, the conductor must make out his trip report, and the car should be swept out and briefly inspected. Some allowance for delay inbound must also be made, so that a car coming in late can go out on time. Fifteen minutes would seem to be a reasonably fair time for lay-over at each terminal on such a run requiring, say, 2 hr. This would give a ratio of 11 per cent. of lay-over time to total time for a round trip. A shorter time than 15 min. is allowed by many roads at one terminal, and sometimes at both, but unless the running time is made much slower than the capacity of the car equipment warrants, so that the time lost may be made up on the road, too short a lay-over often results in cars leaving the terminals late and eventually demoralizing the schedule.

From the psychological point of view it is desirable to allow the motor-

man of a high-speed car some time in which to relax and rest from the nervous strain under which he performs his duties. The length of time which should be allowed for this reason is an open question. Some superintendents claim that an interurban motorman is under less nervous and physical strain while operating his car at 50 m.p.h. or 60 m.p.h. than the motorman on a city car who runs through crowded streets. The interurban motorman, therefore, requires no more time, if as much, to relax than the city motorman. Other railway men take the opposite view.

It will be worth while for the manager of every interurban to give this complex subject of schedules careful study with the view of effecting possible economies in operation. One method, of course, would be that of disregarding the hourly or half-hourly plan of operation and of operating cars every 43 min., or every 70 min., or with whatever interval would best suit the length of the run. This would mean, obviously, that the patrons of the road would have to depend upon a printed timetable for their knowledge of the times of departure of the cars. In some cases such a plan might be the best to adopt, especially on lines where there is much of a morning and evening rush, when it would be desirable for traffic conditions to shorten the headway between cars. For the ordinary interurban railway, however, we believe that most managers would be loath to adopt such a plan except to avoid an extremely long lay-over. Another alternative is to extend the run of the car so as to utilize the wasted time; another is to shorten the time of run by shortening the route, or by omitting a few stops, or by changing the gear ratio. Each case will have to be decided upon its own merits. The principles to be followed are for the company to strike the best balance possible between the various conflicting factors.

Conditions Changed by Growth.—As the traffic of an interurban railway grows and extensions to important towns are added the strictly local train service with its larger and uncertain number of flag stops will make necessary a through service between the larger towns to obtain absolute running time. To operate limited and local trains over the same tracks requires a renewed study of meeting-point conditions, the possible inauguration of an irregular headway and the disturbance of timetables which are in the fond memory of every regular rider. The limited trains must be operated to meet the needs of long-distance riders, especially for train connections, while the local service must take care of the less definite local traffic.

Before making the change it would be well to determine by direct inquiry what the nature of the repeater traffic is. In all probability the founding of the interurban leads many people to live outside the larger cities. But the same people still come into town to work, to shop and to

amuse themselves while the children, especially of high school age, also have to travel in and out every day. The first thing, therefore, is to arrange the new table without too great interference with the fixed habits of the steady riders.

With the public convenience and the matter of new meeting points settled, the trainmen must receive a timetable which will supplement the usual information by separate sheets devoted to one train, particularly if the train runs as a limited one way and as a local the other way. For instance, when the Iowa & Illinois Railway inaugurated such a service several years ago each sheet issued gave complete running instructions from the time the train left Clinton until its arrival in Davenport, stating at what points certain trains were to be met, the meeting points for city cars, etc. Another set of sheets was issued to the crews of the street railway cars to secure their aid in minimizing interference with an interurban train on joint tracks. A great deal of publicity, of course, was required to accustom the public to the changes in time.

Interurban Speeds.—The early operators of interurban railways rather overestimated both the free-running and schedule speeds. Free-running speeds of 60 to 70 miles an hour have rarely been attained owing chiefly to the excessive drop in voltage at long distances from the substations and partly to inferior roadway and sharp curves. Likewise we find that the schedule speeds tend to fall from year to year as growing population increases the number of stops in city and country. Most of our interurbans operate over city street tracks in passing through towns, but some of the later roads have acquired right-of-way from terminal to terminal in full accord with steam railroad practice. Many of the older roads will have to do this or at least keep off the main street if they do not want to degenerate to suburban lines. Steam railroad passengers find it a matter of course to ride or walk to the one steam station in town. Why should the heavy interurban car stop everywhere? It would be far better for the interurban line to give transfers to local cars where it enters the town and have its cars make only a few stops.

The Lehigh Valley Transit Company, which operates between Allentown and Philadelphia, deserves special mention for what it has done to speed up its service. It found that despite earlier protests double the traffic came to the line after it ran outside the towns over right-of-way than when it crawled through them over the streets. Thus in 1914-1915 an expenditure of \$250,000 took 8 miles of track off the street routes and eliminated more than sixty bad curves. While the route length was cut only 1.6 miles the running time was cut fully 17 min. The removal of the track from city streets to right-of-way was accompanied by the construction of standard stations with night and day agents and offices for passenger, freight and express business.

The company also analyzed its stops on 45 miles of track and found it desirable to abolish twenty-two inter-town stops. This, too, met with protests from a few but with commendation from the many.

Still a third factor in speeding up the line while making operation safer, has been the substitution of train service for double-headers.

The Lehigh Valley Transit Company operates limited and local trains in alternation. The through limited trains between Philadelphia and Allentown cover a distance of 56 miles in 1 hr. 57 min. with nine regular stops and two flag stops. Both classes of service operate hourly, thus giving the larger communities a 30-min. service.

While the adoption of high-grade signal systems has done much to promote safe high-speed service in late years, the following speed figures from the 1911 report of the American Electric Railway Transportation & Traffic Association, covering forty-four railways and 3041 miles of single track, offer a sufficiently accurate picture of speed ranges on American interurbans, although individual lines may run up to 70 m.p.h. for free running, 45 m.p.h. for the schedules of limiteds and 40 m.p.h. for locals:

Average of maximum free-running speeds 43 m.p.h.

Average of schedule speed, local trains, 22.12 m.p.h.

Ratio of average of maximum free-running speeds to average schedule speed, local trains, 1.944.

Average schedule speed, limited trains, 32.34 m.p.h.

Average schedule speed, local trains, on lines which also operate limited service, 23.74 m.p.h.

Average of maximum free-running speeds of roads operating both local and limited service, 50.6 m.p.h.

Ratio of average of maximum free-running speeds to limited service average schedule speeds, 1.503.

Ratio of average of maximum free-running speeds to average schedule speeds of local trains on roads which also operate limited service, 1.811.

Ratio of average schedule speed, limited service, to average schedule speed, local trains, 1.362.

One thing apparent from the foregoing is that the ratio of free-running speed to schedule speed is too high to be economical. While the car-equipment department, by changes in gear ratio or the adoption of tap field motors, can correct any unfitness of the equipment to the service, it lies with the transportation man to take the initiative since he knows exactly what speeds really are being obtained at the moment.

Through Cars.—There is absolutely no question that through cars create business. However, there are radical differences of opinion as to how the cars should be operated, particularly with reference to their maintenance and manning, the division of revenue, etc.

Some believe that the interurban or foreign car should be manned by the city men provided the city railway pays a fair revenue for the use of the cars while on its lines. The city company would receive all local revenue and be liable for all accidents, provided such accidents were not due to defects in the car existing at the time it was delivered by the interurban company to the city company.

Others prefer that the foreign company should operate its own cars with its own crews into the city, dividing the fare on some agreed basis with the city company, the latter to assume the maintenance of track and overhead, and the foreign company to furnish the crew, maintain the car and be responsible for accidents not due to defective track, line or power supply.

Still another arrangement is for the interurban company to operate through cars over the city company's lines, with its own crews, cars and equipment, taking all the revenue and paying to the city company an agreed revenue per car-mile. This last arrangement is in some cases modified or reversed, so that the car is operated under the jurisdiction of the city company over its own rails, the city company to take all the revenue and pay to the interurban company an agreed rate per car-mile for the use of the cars and equipment and per car-hour for the crews.

Interurban Watch Inspection.—On interurban railways, especially single-track lines, exact watches are a self-evident necessity. Many lines, therefore, have installed watch-inspection systems, as it would not do to rely on the trainmen, service car-crews or track gangs to keep their timepieces in perfect order. The following account of practice on two lines of the Central West indicates that a company may arrange for watch inspection and purchase either with individual jewelers in each locality or with some wholesale house.

On the Illinois Traction System, contracts are made with individual local jewelers. Variations must not exceed 30 sec. per week. The general superintendent appoints the inspectors. The latter report to the division trainmasters. The company has arranged to permit men to buy watches from these inspectors on the basis of four monthly payments. Before going on a run this railway's trainmen must compare time with the dispatcher and with each other.

On the Aurora, Elgin & Chicago Railroad, a jewelry firm is appointed as general inspector. This company in turn appoints other jewelers as local inspectors. All inspections are made free of charge, the compensation of the local jewelers being derived from watch sales and repairs. The general inspector, however, receives from the railway a salary based on the number of track miles operated. All employees who use the schedule must obtain a certificate of watch inspection semi-annually from the division superintendent. The nearest inspector on presentation of

certificate will then check the watch and give a report thereon to the division superintendent. If the watch is accepted as standard the employee arranges through a proper card, to report to the local inspector for a watch quiz every two weeks. A watch is regulated if it varies more than 30 sec. during the interval between the inspections. The watch record card is carried by trainmen for presentation to the superintendent on demand. Trainmen are also required to check their watches against a Western Union clock in the dispatcher's office either personally or by telephoning the dispatcher. If a watch requires repair the local jeweler must be prepared to loan one in perfect condition. This is recorded on a "loan" card, and the watch is subject to exactly the same conditions as the one replaced. The standard watch specified, if the original is not good enough, is a 17-jeweled lever-set Brequet hair spring, patent regulator, adjusted, size 16 or 18.

Timetables and Train Orders for Trainmen.—As noted in the description of city timetables urban companies furnish headway sheets only. The platform men get all the information they need about their runs either from complete schedules or from run guides alone. Such information is posted in the carhouses as writing on large boards or in the form of framed blueprints. Of course, a man soon learns to remember his time-points without carrying any papers although as noted in the previous chapter, a clock with time-point indications may be used.

On suburban and interurban railways all trainmen should have a timetable to give them the points where they are to register their trains in and out, where they are to report to the dispatcher, where the telephone boxes or booths are located, what the speed limits are in the cities and villages along the route, how the nearest company doctor can be reached in case of accident, what stop numbers are in use with specific classes of trains, etc.

Train orders should not be carried in the trainman's cap or pocket. Their proper place is on an illuminated clip file or board located directly over the controller where it can be neither overlooked nor mislaid.

In 1911 a committee of the American Electric Railway Transportation & Traffic Association prepared tentative interurban working timetables, making the following recommendations in the case of single-track lines:

That a single sheet was most satisfactory and economical, and preferable to book form.

That the timetables should be folded in convenient form, have $\frac{1}{2}$ -in. columns, should be folded to 3 in. thus giving six trains to the fold and, assuming from twenty-four to thirty trains in each direction, requiring four or five folds. As the sheet would be 6 in. deep, the folder would reduce to pocket size.

That where regular meets are shown by continuous rows of black face figures, guide lines should be inserted midway between such rows; and where the meets are irregular, guide lines should be inserted between every fifth and sixth row.

That the schedule should appear on one side of the sheet and all special instructions on the other side.

That the title should be printed on the first page as folded, and that the table should be folded so as to open at the center where station names are shown.

For double-track operation the suggestions were as follows:

That the same form of folded sheet be utilized for double-track operation by folding once across and printing the time of the trains in opposite directions on the two exposed faces, special instructions to be printed in the last fold of the table.

That the use of heavy face type for p.m. trains was objectionable, because it interfered with the full face type required by the code of rules.

That station names should be printed in the center and that companies with a very large number of trains might repeat the list of stations at either end.

That it was possibly desirable to show the time of inferior-class trains in at least one direction; that such trains should be placed at each end of the timetable and separated from the first-class trains by a heavy line. The committee thought this would aid to maintain satisfactory speed and reduce the number of train orders that would be required if trains were operated in both directions as extra trains.

That where the stations are shown in a single column, the time of trains in one direction should read down and in the other direction read up. Where separate tables are used for trains running in opposite directions on double track and station names are repeated in each table, the names should read down.

That the distance of each station from one terminal should be shown in decimal hundredths of a mile in a column on one side of the list of stations and the distance in reverse direction from the other terminal should be shown in a column on the other side of the list of stations.

That where the cars of one company operate over the tracks of another, the time of such cars should be shown in italics, for information only.

That Saturday and Sunday service, when it varies materially from that of other days, should be shown on the schedule with the proper designation at the head of the column, as "Sunday only" or "Saturday and Sunday" in heavy black type, these trains to be shown in the regular order of leaving times; also that no red type be used except where a new

schedule is used for Sunday, in which event the use of red in printing this Sunday schedule is recommended.

That typographical symbols for designating service, as for instance, * Sunday only; † Saturday only, etc., be avoided.

That northbound and westbound trains receive odd numbers and east and southbound trains receive even numbers, as usual on steam railroads; that the numbers start at midnight as No. 1, westbound, and No. 2, eastbound, each succeeding train to receive the next higher number in the order of terminal leaving time; that a different series of hundreds be assigned to each division; and that the trains of foreign companies receive distinctive numbers. Inferior class trains should have a higher series to distinguish them from first class.

That in constructing interurban timetables, the maximum table, so far as possible, be considered in numbering trains and when trains are withdrawn, that the numbers and spaces be left blank so that if trains are subsequently added to take the place of those withdrawn, the same number will apply to such substituted trains. This will provide practically a standard of train numbers for specified hours and be useful as a means of identification for accounting and other purposes.

To date, the American Electric Railway Transportation & Traffic Association has not found a generally satisfactory form of interurban timetable. At the 1915 convention the committee on schedules and timetables noted the following objections to the folder type:

A folder form of interurban timetable is inconvenient in unfolding and while it may allow for insertion in the pocket of trainmen it will not stand the wear and tear as when in book form. Several companies report that the standard table cannot be adopted since it will not cover the local operating conditions that characterize their lines. Other companies report complete satisfaction with their present form of tables and see no reason for any change.

Other features causing criticism are the necessity of reading up for trips in one direction and the lack of a run guide. In the case of the operation of three tables for weekday, Saturday and Sunday, three different tables would be necessary in order to have the special instructions printed on all three, whereas in a book form this objection is overcome and a more convenient table for handling is provided.

The committee believed the standard form was not suitable for general use for the following reasons:

1. The folded size is ill chosen, as a larger form could be used to better advantage and still fit in the pocket readily.

2. The title page is weak, as the two important features, namely, timetable number and the date effective, are not given the prominence which they deserve.

3. In the body of the table one form is used for single-track operation and another for double-track operation. This is neither necessary nor advisable. Also the table is so arranged that an unnecessary amount of room is given over to the space for rules and the arrangement is such that the table in practice would be unwieldy in size and very difficult to read.

4. The type is not good as it does not give the proper contrast between heavy and light-face figures, and the style is one that makes it difficult to read across the table on account of the lack of alignment of the different figures. The set-up of the table is such that making changes would be unnecessarily expensive.

The 1916 committee coincided with the recommendation of the 1915 committee in criticizing the arrangement of placing the stations in the center of the sheet and having the times of trains in one direction shown at the left of the stations to read down and the times of trains in the opposite direction placed at the right of the stations to read from the bottom up. It preferred the plan of a separate table for each direction running, but admitted that opinions differed greatly on this point.

Book Form Tables.—A page from the table of an eastern interurban railway with double-track sections, including joint running over city tracks, and names changed, is reproduced in Fig. 73. It is of the book type. The original is 11 in. by $9\frac{1}{2}$ in. in size so that even when doubled it is not convenient for the pocket. On the other hand the individual pages are commendably clear. Following standard steam railroad practice all westbound trains are designated by odd numbers while eastbound trains have even numbers. The vertical divisions show the mileage and running time between stops, the names of the stops and the running times of the successive trains. The extra large figures show the meeting or passing time of opposing trains while the corresponding small numbers above (printed red in the original) are the designations of the opposing trains. This table is particularly simple as but one class of trains is operated. Asterisks, daggers, etc., are used in the customary way to indicate purely weekday trains, short-trippers, etc. In the original also the horizontal lines shown between the running times were printed in red for the purpose of ease in reading across the page. The writers have added to this table indications to show single-track sections.

The timetable described contained eight folios, exclusive of the cover. The back carried the following instructions:

SPECIAL INSTRUCTIONS

1. Trains in either direction have no superior right over trains of the same class in opposite direction and will meet trains as per timetable unless otherwise ordered by dispatcher.

2. Schedule meeting or passing points are indicated in full-faced type. The number of trains that are to be met or passed are shown by small red figures above time of meeting or passing.

3. Extra trains must clear all regular trains for 5 min. See Rule No. 8 and Bulletin No. 6.

4. The clock in dispatcher's office will be the standard clock from which trainmen will secure time.

5. Reporting stations are located at Aristotle, Glaucus Junction, Xenophon Junction, Charon Junction, Cleon Junction and Apollo Junction.

WEST BOUND		ATHENS-SPARTA RY.												THRACE DIVISION			
MIN	SEC	TRAIN NUMBERS	1 A.M. DAILY	3 A.M. DAILY	5 A.M. DAILY	7 A.M. DAILY	9 A.M. DAILY	11 A.M. DAILY	1 P.M. DAILY	3 P.M. DAILY	5 P.M. DAILY	7 P.M. DAILY	9 P.M. DAILY	1 A.M. DAILY	3 A.M. DAILY	5 A.M. DAILY	7 A.M. DAILY
0.0		Athens					6.00	6.30	7.00	7.30	8.00	8.30	9.00	9.30	10.00	10.30	11.00
0.3	30	Zona					6.30	6.55	7.25	7.55	8.25	8.55	9.25	9.55	10.25	10.55	11.25
1.7	10	Aristotle					6.45	7.00	7.30	7.55	8.25	8.55	9.25	9.55	10.25	10.55	11.25
0.4	3	Sophocles					6.53	7.08	7.38	7.53	8.23	8.53	9.23	9.53	10.23	10.53	11.23
2.9	2	Erastides					6.53	7.08	7.38	7.53	8.23	8.53	9.23	9.53	10.23	10.53	11.23
11.7	4	Plato					6.57	7.13	7.43	7.57	8.27	8.57	9.27	9.57	10.27	10.57	11.27
14.0	2	Glaucus					7.00	7.15	7.45	8.00	8.15	8.45	9.00	9.15	9.45	10.00	10.15
1.7	5	Xenophon Junc.					7.50	7.50	8.00	8.30	8.30	8.40	8.50	9.00	9.30	9.30	9.40
2.5		Demosthenes Branch Loop					7.50	7.50	8.00	8.30	8.30	8.40	8.50	9.00	9.30	9.30	9.40
0.1	15	Demosthenes					7.50	7.50	8.00	8.30	8.30	8.40	8.50	9.00	9.30	9.30	9.40
		Try					7.50	7.50	8.00	8.30	8.30	8.40	8.50	9.00	9.30	9.30	9.40
10.5	3	Demosthenes Junc. R. R.					7.00	7.00	8.00	8.00	8.10	8.20	8.30	8.40	8.50	9.00	9.10
11.7	5	Aristophanes Hiding					7.00	7.00	8.00	8.00	8.10	8.20	8.30	8.40	8.50	9.00	9.10
20.2	5	Plato Hiding					7.13	7.13	8.13	8.13	8.23	8.33	8.43	8.53	9.03	9.13	9.23
21.1	2	Charon Junc.					7.15	7.15	8.15	8.15	8.25	8.35	8.45	8.55	9.05	9.15	9.25
21.6	2	Harocles Hiding					7.17	7.17	8.17	8.17	8.27	8.37	8.47	8.57	9.07	9.17	9.27
22.0	2	Xanthippe Hiding					7.30	7.30	8.30	8.30	8.40	8.50	9.00	9.10	9.20	9.30	9.40
22.9	2	Asclepius Hiding					7.30	7.30	8.30	8.30	8.40	8.50	9.00	9.10	9.20	9.30	9.40
23.7	2	Heracles Hiding					7.30	7.30	8.30	8.30	8.40	8.50	9.00	9.10	9.20	9.30	9.40
24.4	2	Europa Hiding					7.30	7.30	8.30	8.30	8.40	8.50	9.00	9.10	9.20	9.30	9.40
25.4	4	Democritus Hiding					7.30	7.30	8.30	8.30	8.40	8.50	9.00	9.10	9.20	9.30	9.40
26.2	5	Alcibiades					7.30	7.30	8.30	8.30	8.40	8.50	9.00	9.10	9.20	9.30	9.40
27.3	7	Orpheus					7.45	7.45	8.45	8.45	8.55	9.05	9.15	9.25	9.35	9.45	9.55
27.9	2	Agathon					7.47	7.47	8.47	8.47	8.57	9.07	9.17	9.27	9.37	9.47	9.57
28.9	2	Philo Hiding					7.50	7.50	8.50	8.50	9.00	9.10	9.20	9.30	9.40	9.50	10.00
29.5	2	Cleon Junc.					7.57	7.57	8.57	8.57	9.07	9.17	9.27	9.37	9.47	9.57	10.07
31.5	5	Achilles Hiding					8.02	8.02	9.02	9.02	9.12	9.22	9.32	9.42	9.52	10.02	10.12
32.0	4	Electra Hiding					8.04	8.04	9.04	9.04	9.14	9.24	9.34	9.44	9.54	10.04	10.14
35.5	6	Arcton					8.08	8.08	9.08	9.08	9.18	9.28	9.38	9.48	9.58	10.08	10.18
42.2	7	Olympus Hiding					8.22	8.22	9.22	9.22	9.32	9.42	9.52	10.02	10.12	10.22	10.32
42.5	4	Hyacinth Hiding					8.25	8.25	9.25	9.25	9.35	9.45	9.55	10.05	10.15	10.25	10.35
43.4	5	Quintus Hiding					8.29	8.29	9.29	9.29	9.39	9.49	9.59	10.09	10.19	10.29	10.39
45.1	5	Argive Hiding					8.34	8.34	9.34	9.34	9.44	9.54	10.04	10.14	10.24	10.34	10.44
47.9	4	Heliodorus Hiding					8.39	8.39	9.39	9.39	9.49	9.59	10.09	10.19	10.29	10.39	10.49
49.5	3	Salomon Hiding					8.41	8.41	9.41	9.41	9.51	10.01	10.11	10.21	10.31	10.41	10.51
51.2	4	Orontes Hiding					8.45	8.45	9.45	9.45	9.55	10.05	10.15	10.25	10.35	10.45	10.55
52.0	4	Pythias					8.49	8.49	9.49	9.49	9.59	10.09	10.19	10.29	10.39	10.49	10.59
55.4	3	Apollo Junc.					8.53	8.53	9.53	9.53	10.03	10.13	10.23	10.33	10.43	10.53	11.03
56.0	10	Sparta					9.00	9.00	10.00	10.00	10.10	10.20	10.30	10.40	10.50	11.00	11.10

* Daily except Sunday

FIG. 73.—Part of a book timetable used by an eastern railway.

6. Train order board is located at Glaucus Junction.

7. Train order board when in stop position must not be passed without train order or clearance from dispatcher.

8. Time shown at sidings applies to east end of switches.

9. Track between Cleon Junction and Apollo Junction and Xenophon Junction and Demosthenes is used jointly by trains of Athens-Sparta Railroad and Thrace-Macedonia City Railway. All movements in this section will be governed by block signal indications, under Thrace-Macedonia City Railway rules.

10. Trains of Athens-Sparta Railroad operating in Sparta, Demosthenes, Aris-

tote and Athens will be subject to the rules of Thrace-Macedonia City Railway, and to the traffic regulations and ordinances of those cities.

The working timetable of the Albany Southern Railroad put into effect June 25, 1911, is in book form and measures $4\frac{1}{8}$ in. by $6\frac{3}{4}$ in. The list of stations and the distances are printed on a left-hand page, which when unfolded extends out beyond the cover and the other pages of the book. In this way one list of stations can be used to refer to the columns of train time shown on any of the following eight pages. Each page of the working table contains ten columns, each $\frac{5}{16}$ in. wide. Four pages are used for showing the times of thirty-five first-class trains and one second-class southbound train, and the next four pages are used for an equal number of northbound trains. Enough space is left at the top for the name of the railroad, the direction of the train movement, the number of the timetable and the class of the train shown. At the bottom of each page are printed the main instructions to trainmen, especially on safety. In addition to the table the pamphlet contains sixteen pages of special instructions, extracts from the rule book, instructions on the prevention of accidents, and a list of physicians and hospitals in the different towns reached. Much information also has been included in the form of special notices issued from time to time and which do not appear in the company's standard rule book. Files of special notices on the bulletin boards on the power houses have been removed and all the instructions in force have been incorporated in the timetable. This is a good plan for it is practically impossible to get all the trainmen to study a large file of old special notices often enough to keep the instructions fresh in their minds.

Revising Tables.—Instead of issuing supplements or patches when an old table is corrected it is far safer to print an entirely new table and still safer to use different colors for successive tables. In any event, a large number of changes could be avoided if the schedule stated definitely that certain trains would be discontinued after or inaugurated on specified dates. This practice, of course, is well known on steam railroads.

Pocket Tables.—Several ways of printing these timetables in a form convenient for pocket carriage have been developed. A popular form is of the folder type inclosed in pasteboard covers $9\frac{1}{2}$ in. by $2\frac{1}{2}$ in. wide to fit easily in the pocket. When open, the timetable is a single sheet $21\frac{1}{2}$ in. long but as it is in folder form the trainman can look up any single train with one hand without opening it entirely.

The Bay State Street Railway issues a table which shows the time at all turn-outs and junctions on each of forty-nine routes on single-track lines outside of city limits. A full division is not printed in one book as then the entire table would have to be reprinted whenever a change is made on any one route. To add to safety of operation, no supplements

are issued when there is a change in schedule. Instead the entire table is reprinted with a new large blue number on the title page. When the table is issued to the men their signatures are taken on a blank provided for the purpose and the superseded table is called in and destroyed. This timetable folds to 35½ in. by 8 in. This size is standard and the number of folds is changed to suit the number of trips on the different routes. All tables which would be in excess of six folds are made up in book form, which also folds to the standard size. All the trips in one direction are shown on one side of the sheet and those in the opposite direction are on the opposite side, the order of stations being inverted so that all the times read down. Guide-lines are used when the table is of such size that there would be chance of confusion and mistakes without them.

Every trainman is provided with a printed timetable for his route together with a fiber wallet in which to carry it. To facilitate the use of the tables each route has a key number which is used as the hundreds figure in the timetable numbers, the tens and units figures showing the number of tables which have been used for this route. For example, timetable No. 3509 is the ninth table issued for route No. 35 and would supersede timetable No. 3508. As this system of numbering is also used for the run guides, there is always a printed table and a correspondingly numbered run guide.

The instructions printed on these timetables follow:

CORRECT TIMETABLES

1. Employees engaged in transportation service must provide themselves with a copy of the current timetable for each interurban route operating out of the carhouse at which they are employed, and always have same with them when on duty. Receipt of timetables must be acknowledged to the superintendent on the prescribed form. When a new table takes effect superseded issues must be destroyed at once.

ARRIVING AND LEAVING TIMES

2. When but one time is given for a car it is, unless otherwise indicated, the leaving time, except in the case of a terminal, where it is the arriving time. Where two times are given they are the arriving and leaving times.

WHERE TIME APPLIES

3. Unless otherwise indicated, time applies to the turn-out. Where there is no turn-out it applies to the place where traffic is received or discharged.

SCHEDULED MEETING POINTS

4. Scheduled meeting points or passing points are indicated by figures in full-face type, thus: **6.25**.

Both the arriving and leaving times of a car are in full-face type when both are

meeting or passing times, or when one or more cars are to meet or pass between those times.

Cars *must not pass* scheduled meeting points until opposing car or cars have arrived, except as provided in Rule 29.

MOVEMENT OF CARS

5. A car must not leave its starting point on any division, or a junction, or pass from double or single track until it is ascertained whether all cars due have arrived or departed. If this is impossible and signals are inoperative, the car will proceed as provided in Rule 29.

CASES OF DOUBT

6. *In all cases of doubt or uncertainty take the safe course and run no risks.*

In concluding this subject it may be apropos to mention the attitude of trainmen toward timetable construction. Of course, many of the men are inclined to believe that they could do better than the timetable man. It is not a bad plan, therefore, to invite the men to try their hands at the game of schedule construction that they may better appreciate the conditions. A prize of \$25 for the best table submitted within the limiting conditions will stir up a lot of interest, discredit future complaints and perhaps develop a schedule genius.

Train Dispatching on Interurban Railways.—The train dispatching system of interurban electric railways is based in large degree on the train order system of steam railroads, except that the telephone is used in preference to the telegraph. Some companies have the platform men stop at telephone booths; others, particularly where time is an object, provide the men with hooked poles whereby a circuit between the dispatcher and a car telephone is established without leaving the car. The following descriptions of the practice of two large railways will give a fair idea of these practices.

Company No. 1 operates 90 miles of single track with the dispatchers on 8-hr. tricks. The telephone system consists of a private dispatching wire and a commercial wire, both of which are cut in at all sidings. Register stations are located at all terminals and ends of double track. Each telephone booth, which is electrically lighted, has a locked box wherein the conductors deposit a copy of all orders received.

The double-check "31" order is used exclusively. This means that the order as copied by the conductor must be repeated by both the conductor and motorman, whereupon the word "complete" and the time are given by the dispatcher. The motormen are also trained to receive train orders.

In handling trains in sections the usual steam railroad system is used, namely, green flags by day and green lights by night. The same order system is used. The conductor of the first section copies a sufficient

number of orders to cover the sections of that train and his motorman repeats them to the dispatcher. The crews of the following sections repeat the orders in turn to the dispatcher, receiving a "complete" from him when he is satisfied that the orders are understood by each crew.

If one or more sections drop out at a non-register station, this fact is promptly reported to the dispatcher, who satisfies himself at once that the order has been fulfilled. Then he immediately notifies all opposing trains that a section of a certain train has dropped out at that certain point. However, if a train displays signals for one or more sections to a given point and if its crew takes down the signals at that given point, the crew so notifies the dispatcher and proceeds as a single train to destination. The crew must also, in all cases, stop opposing trains and advise them that it has displayed signals to that certain point. In fact, trainmen are required to notify each other personally at all meeting points what train they represent. On other roads, visual or audible signals are preferred in order to save time.

When advance notice is given of special movements the dispatcher treats them as sections. When the sections are designated to run to non-register stations, all opposing trains receive a copy of the section order. While this insures double safety it also gives the dispatcher a chance to move special trains without delay.

Freight cars are moved as second-class trains. This obliges all irregular extras to keep clear, thereby adding safety, facilitating movement and decreasing the number of train orders. Another important advantage is that the cars will not be tied up in cases of wire trouble, because regularly scheduled trains are well known to every experienced employee along the line.

To add to the safety of running trains in sections, a box with lettered and numbered slides is placed in the cab window to indicate whether the car is the first, second or last section or an extra.

To remind the motorman that he has orders to fulfill, each car carries a small red incandescent lamp just above his order clip board. This lamp is turned on by the motorman as soon as he places an order in the clip, and it remains lighted until the order has been fulfilled. It would be better, of course, if the lamp were to light automatically on the insertion of the order.

Instead of leaving only the motorman to safeguard the train the following scheme may be used: Arrange a small rack in the cab in which the numbers of trains to be met can be placed in order before a train leaves its terminal, and require the conductor to go to the cab and remove the train numbers in the order in which the trains are met. In this way the attention of both the conductor and motorman is called to the meet. Where meets are made on double track or on sidings the motorman should

be required to call the attention of the conductor to an approaching train by a bell, and the conductor should ring the motorman's bell when approaching a meeting point.

Furthermore, disputes due to the verbal transmission of orders have been eliminated on at least one railway (the Southwest Missouri) by the use of the dictaphone. This is operated in connection with the telephone, the cylinders being kept intact for a few weeks and then shaved for re-use.

Company No. 2 uses a train clearance order as well as the "31" telephone order. Order offices are situated about 10 miles apart and are positive block stations. Trains cannot pass or leave these stations without obtaining one of these forms of orders. In the absence of other orders the train clearance order is used to allow a train to pass a positive block station. It is issued by the dispatcher under a distinct order number and is recorded in the dispatcher's order book with the train number, car number, time O.K.'d, station receiving and operator's name. The operator, after repeating this order to the dispatcher and receiving the O.K., hands it to the conductor, who repeats it to the operator, the operator giving the "complete." Copies are supplied for both the conductor and motorman and one is retained by the operator for his record.

When it becomes necessary to make train movements not provided for in the timetable the "31" order is used and is issued in the following manner:

The operator at the station where the order is to be placed for the superior train is called and is instructed to copy three or as many more as are required. Then the operator at the station where the order is to be placed for the inferior train is called to take the same instructions. The dispatcher then gives the order number and the addresses of the trains in the order of their superiority. The order is then transmitted and is written in full without abbreviation by the operator. After the dispatcher has transmitted the order and the superintendent's initials, the operator reads it back to the dispatcher without abbreviation. The dispatcher then O.K.'s the order if correct and the operator gives his name and order number.

The operator hands the order to the conductor of the train addressed. The conductor then repeats the order to the dispatcher without abbreviation and when he has concluded he gives his name and train number. The dispatcher "completes" the order if correct, giving the time and his initials. The order is then in full force and effect and a copy is given to the motorman by the conductor. The motorman must read his order aloud and without abbreviation to the conductor, the conductor watching closely to see that the motorman repeats it correctly. After the order is fully understood by the conductor and motorman they may proceed.

AURORA, ELGIN & CHICAGO R. R. CO.

TRAIN ORDER NO.

CHIEF DISPATCHER'S OFFICE 191

TO C. & M. TRAIN NO. CAR NO.

AT

CONDUCTOR	TRAIN NO.	O.K. AT	
		M	DISP'R
	TRAIN NO.	RECEIVED	
MOTORMAN		M	OP'R

MOTORMAN AND CONDUCTOR MUST BOTH HAVE A COPY OF THIS ORDER

FIG. 74.—Train order given to platform man personally.

The Aurora, Elgin & Chicago R. R. Co.

TRAIN ORDER BLANK

..... **EAST**
..... **WEST**

Order No. Time Date 19

TO CONDUCTOR AND MOTORMAN:

Train No. Car No. at

Meet Train No. Car No. at

Meet Train No. Car No. at

and report at

.....

..... **Conductor** **DISPATCHER**

..... **Motorman**

FIG. 75.—Telephone train order form.

Serial No. _____

The Aurora, Elgin & Chicago R. R. Co.

TRAIN ORDER

_____ **EAST**
_____ **WEST**

Date _____ 191 _____

TO CONDUCTOR AND MOTORMAN:

Train No. _____ Car No. _____ at _____

Meet Train No. _____ Car No. _____ at _____

Meet Train No. _____ Car No. _____ at _____

and report at _____

Serial _____

Order No. _____ O. K. at _____

_____ Conductor _____

_____ Motorman _____

DISPATCHER

FIG. 76.—Dispatcher's serial record of train orders.

THE AURORA, ELGIN & CHICAGO R.R. CO.

DELAY REPORT

DATE _____ 191 _____

TRAIN NO. _____ DIVISION SUPT. _____

_____ DUE TO ARRIVE AT _____ TIME _____ A.M. P.M.

WAS DELAYED FROM _____ A.M. P.M. TO _____ A.M. P.M. AT _____

CAUSE _____

SIGNED _____ MOTORMAN.

_____ CONDUCTOR.

ALL DELAYS OVER THREE MINUTES MUST BE REPORTED ON THIS SLIP

FIG. 77.—Train delay report.

The requirements where orders are delivered at sidings are the same as the foregoing, except that the motorman becomes the operator and receives the order and O.K. from the dispatcher, the conductor getting the "complete" in the usual manner.

Train dispatching on this system is simplified by the rule that trains in either direction have no superior rights over trains of the same class in the opposite direction, but that they must meet as per timetable unless other orders are issued by the dispatcher.

Train Order and Other Forms.—The forms used by the Aurora, Elgin & Chicago Railroad will give some further ideas on interurban train-dispatching practice. Fig. 74 shows the train order given separately by the dispatcher to the motorman and the conductor when accepted personally; Fig. 75 shows the train order form used when the crew is instructed by telephone. This form is made out in triplicate, and is signed by both the conductor and motorman. (On most interurbans this triplicate is retained for the company's records within the train order holder.) The dispatcher keeps a *serial* record of all train orders on the form shown in Fig. 76, which is made up eight to a folder. Crews report delays exceeding 3 min. on the form shown in Fig. 77. Still another form used, but not reproduced, is the train sheet on which all train movement, including delays, is recorded.

CHAPTER VIII

FARES

The straight 5-ct. fare with transfer privilege included was long a most prominent and meritorious feature of American city practice. European managers who visited this country in the early days of electric traction often commented upon the fortunate circumstance, so far as American street railways were concerned, that the smallest nickel coin in this country, 5 cts. defrayed the average cost of carrying a passenger on an American city railway system and paid a fair profit to the company. Indeed, in their opinion, this fortuitous condition was in large measure responsible for the system of uniform fares prevailing on American street railways, because 1 ct. was too small for a uniform fare, the 2-ct. piece and the 3-ct. piece were never very common, and the 5-ct. piece answered the requirements. In their opinion, had a similar monetary system prevailed abroad, many of the companies might have adopted the uniform fare there rather than the zone system.

Conditions have greatly changed since that time. We need not enter here into the economics of the situation but can outline them briefly by quoting the following conclusions from Chap. IV "Tendency of Operating Costs" in "Cost of Urban Transportation Service" by F. W. Doolittle.

"1. Comparing conditions obtaining at the beginning of the electric traction industry, being the period 1890-1895 for most urban traction systems, and present conditions, it is noted that there has been a substantial increase in service rendered. The length of ride for a single fare has increased with the growth of cities and the unification of separate traction systems operating in the same community. The quality of the service as measured in speed, more frequent operation, and more substantial, convenient and safe equipment, has materially improved.

"2. During the same period the single fare has suffered material reduction due to increased use of transfers and commutation tickets. The increased length of haul per passenger has materially decreased the revenues received per passenger mile.

"3. During the same period, construction costs and operating expenses and taxes have been materially increased, due to the increased complexity of urban life and the substantial character of municipal requirements.

"4. During the same period, there has been a substantial increase in the cost at which investors can be induced to furnish money for the development of the industry, due to the general rise of interest rates and competition of other forms of

investment. Agitation against the industry and public restrictions have served to weaken the competitive position of street railway investments.

"5. Labor costs have materially increased, accompanying the advance in the cost of living. The real value or purchasing power of the 5-ct. piece has materially decreased.

"6. Costs of material entering into operation and construction have likewise increased. This increase accompanied by the necessity for the use of more and better material has had an important part in increasing the cost of service."

Increased City and Suburban Fares.—The movement toward higher fares than have prevailed in the past for both city and interurban lines has assumed large dimensions in various parts of the country. Possibly it has been more pronounced in Massachusetts than elsewhere, and in that state several companies, mostly among the smaller properties, have received permission for an increased fare in some cases from 5 cts. to 6 cts. and in the case of some of the suburban lines, a shortening of the zone for which transportation was furnished for 5 cts. so that another zone could be introduced. Fares have been raised in other states also, and the tendency of the day is toward higher electric railway fares.

Riding Habit as Determined by Fare.—Advocates of lower fares assert on general principles that reductions in fare are paid for by the increased business. There is a measure of truth in this if the increased travel could be obtained without a proportional increase in expense. It would not profit a company to get more rush-hour travel, for instance. If the added business does not fill the hollows of the traffic curve, the low-fare idea is a fallacy. To determine this and several other points bearing on the riding habit, F. W. Hild made some instructive studies* in 1913 of which the following is an abstract:

The chart in Fig. 78 shows the "riding habit" in rides per inhabitant per annum for a number of American and British cities with more than 150,000 people.

It is quite clear from the chart that a low rate of fare is not the important determining factor in the creation of the riding habit. If it were, we should expect to find the British cities with their smaller zone charges heading the list, while in the United States we would look for Cleveland, the champion low-fare city, at the top of the list, with Toledo next, and Columbus, Toronto, Indianapolis, Milwaukee and other reduced-fare cities ranking close behind. As a matter of fact, the riding habit is seen to be greater in cities having straight 5-ct. fare (Seattle's twenty-five tickets for \$1 do not carry the transfer privilege). Cleveland is about midway and Toledo near the bottom of this list of American cities. The British cities, despite the lower charges per ride, are far below American cities in the extent of street-car patronage.

* See paper before 1914 Mid-year Meeting of American Electric Railway Association.

The main factors favoring the riding habit are the following: Facilities; topographical conditions such as hilliness; climate favoring outdoor trips; temperamental conditions as in mining and industrial centers; relative locations of business, residential, theater and other districts; industrial activity (good times), and, to a very limited extent only, rates of fare. To these factors may be added tourist travel in cities like Quebec, Los Angeles and New Orleans.

Detroit's experience is illuminating. Beginning Aug. 15, 1913, the rate of fare on the 5-ct. lines was reduced to seven tickets for 25 cts.

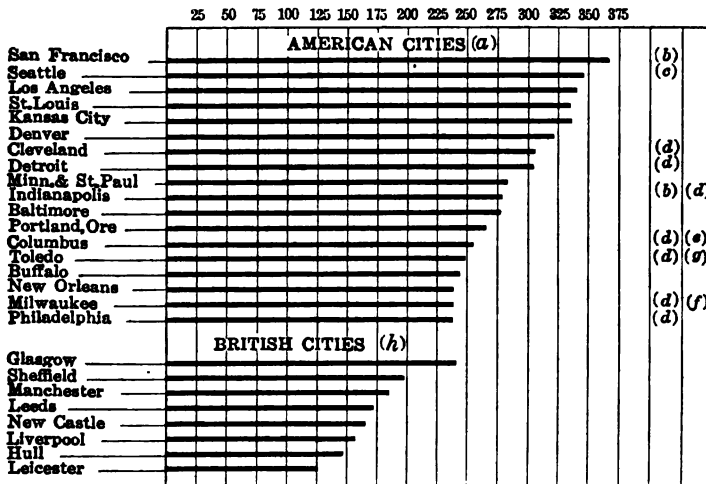


Fig. 78.—Annual revenue rides per inhabitant (F. W. Hild in 1914).

- Only cities exceeding 150,000 population were considered in the comparisons.
 (a) 1910 census and 1910 statistics except as noted. Most of data from McGraw's Manual of Electric Railways or direct from companies.
 (b) Partial data.
 (c) Statistics for 1911-1912. Population estimated.
 (d) Low fare, i.e., majority of revenue passengers pay less than 5 cents per ride.
 (e) Statistics for 1911, strike in 1910. Population estimated.
 (f) Includes free as well as revenue passengers.
 (g) Statistics for 1912. Population estimated.
 (h) Data from Gareke's Manual of Electrical Undertakings, 1913.

The rate of eight tickets for 25 cts. between 5.45 a.m. and 8 p.m. on the so-called "3-ct. lines" continued in effect.

The average fare per revenue passenger for the first month with the reduced fare was 3.67 cts., compared with 4.38 cts. for the corresponding month of the preceding year, a drop of 16.2 per cent. That this reduction had but little effect in stimulating traffic is shown by the statistics on page 198.

Certainly no "stimulation sufficient to offset the losses due to the lower fares" can be discovered in this table.

An effort to enforce the sale of six tickets for 25 cts. in Portland, Ore., caused Mr. Hild, then manager of the Portland Company, to investigate

the probable effect of this reduction, particularly since the same generalization was urged that "lower fares would create enough additional travel to make up for the loss due to the tickets."

PERCENTAGE INCREASE IN NUMBER OF REVENUE PASSENGERS WITHIN SINGLE-FARE ZONE OVER CORRESPONDING PERIOD OF PREVIOUS YEAR (DETROIT)

	Per Cent. Increase
1909, 12 months.....	12.81
1910, 12 months.....	15.88
1911, 12 months.....	10.43
1912, 12 months.....	14.76
1913, Jan. 1 to July 31.....	16.67
August (fare reduced).....	16.03
September (fare reduced).....	19.42
October (fare reduced).....	16.41
November (fare reduced).....	14.65

Five cities which gave six tickets for 25 cts. stated that the percentages of revenue passengers using tickets were as follows:

	Per Cent.
Milwaukee.....	84
Indianapolis.....	82
Washington, D. C.....	80
Toledo.....	80
Ottawa.....	78

The operating data from Portland for 1912 were:

Total passengers.....	89,869,096
Revenue passengers.....	64,768,170
Operating cost per total passenger, revenue and transfer, exclusive of investment return.....	2.63 cts.

On the basis that 80 per cent. of the 1912 revenue passengers would have used the six-for-25-ct. tickets, the loss in revenue would have been about \$387,403.

The number of additional 4.167-ct. passengers which would have to be carried at a cost of 2.63 cts. in order to overcome the loss of \$387,403 would be

$$\frac{387,403}{0.04167 - 0.0263} = 25,300,000$$

"If to this number we add 64,768,670," wrote Mr. Hild, "or the number of revenue passengers carried during 1912, we would obtain 90,068,670 as the total number of passengers. This sum represents an increase of nearly 40 per cent. in passenger traffic. As the estimated city population of Portland in 1912 was 236,000 this would mean 385 rides per inhabitant per annum—a figure about 25 per cent. higher than Cleveland and about 55 per cent. higher than Toledo, cities having the lowest fares in the United States."

Metal Tickets.—For cut-rate fares, a number of railways use metal tickets in place of paper tickets. They have the advantage of easier registration than paper tickets. It is also an economy to have a token which can be used again and again, but sometimes it may cost more to repack them for resale than to print and issue additional tickets. One company, for example, rewraps such tokens in sealed envelopes to sell them under conditions which will prevent manipulation by conductors.

If the railway feels that it must have a metal token in preference to paper it should submit its design to the treasury department of the Federal Government to be sure that the token does not look like United States or foreign currency. The use of perforated tokens like Chinese cash, is least objectionable.

The substitution of metal tokens for paper tickets and the installation of a fare box and registering device especially designed to receive and register pennies, nickels, dimes and metal tickets has effected a tangible saving for the Lincoln Traction Company, Lincoln, Neb. The metal tickets and the registering fare box were put in service on Apr. 1, 1915. Coins of the denominations of 1 ct., 5 cts. and 10 cts., and metal tickets are dropped into one hopper. The registrations of the coins are made on one dial and show on a separate trip and totalizer. Metal tickets or tokens are registered on another dial with a separate trip and totalizer, and complimentary tickets, transfers and all classes of paper tickets are registered on a third dial having a trip and totalizer. With the three registers an excellent check on the work of conductors is obtained.

Before the installation of the registering fare box the company was paying a monthly rental of approximately \$200 for registers. It was also spending about \$60 per month for paper tickets, and it is estimated that about \$25 per month was spent for work in the auditor's office, which has also been made unnecessary. After charging off interest and depreciation on the present fare-collection system, the savings effected by its adoption show a considerable financial gain. Aside from these savings, however, and more important, was an increase of 9.07 per cent. in the cash fares collected for the months of April, May, June and July, 1915, over the same period in 1914. Ticket fares increased during this period 1.44 per cent. and revenue increased 4.79 per cent.

The Lincoln case is quoted in detail merely to show the possibilities of more efficient fare collection where metal tokens are used in connection with suitable registering devices.

The Transfer as a Fare Cutter.—Within certain limits the line transfer practice so characteristic of American electric railways is a part of the railway's routing plan whereby the passenger is brought to his destination with the least amount of mileage and time. But in practice the

transfer has grown from a mutual convenience to a privilege and finally to an abuse. A large part of the transfer business therefore comes logically under the head of "Reduced Fares."

The practices of various companies to limit the abuse of transfers are recounted elsewhere. On some systems the average length of ride has reached the point where it has been found necessary, as on some roads in Massachusetts, to secure permission to charge 1 ct. for each transfer. The 3-ct. exchange ticket of Philadelphia is in a class of its own, but it may be noted that the Anglo-Argentine Company of Buenos Aires charges 2 cts. for a transfer from its subway to surface lines and *vice versa*.

Transfers are rarely exchanged between separate companies. However, in January, 1911, the Tacoma Railway & Power Company and the Pacific Traction Company arranged to do so voluntarily. At the same time the Brooklyn, Queens County & Suburban Railway, part of the Brooklyn Rapid Transit System, and the Long Island Electric Railway were ordered to exchange transfers at Jamaica Avenue. These two companies have an agreement for the joint use of tracks, and the New York law requires that wherever there is such joint use for more than a certain distance, transfers must be exchanged. Details on the use of transfers will be found in the chapter on "Fare Collection and Devices."

Reduced Rates for Workmen.—On foreign railways of all kinds it is customary to sell tickets to workmen at a reduced rate—often as much as 50 per cent. The hours when such tickets are acceptable vary, but they are usually such as will exclude, during a.m. hours at least, the white-collar brigades. Sometimes the rate is so fixed that the payment of the regular minimum fare will permit the passenger to ride for as many fare zones as is necessary; for example, the Hamburg Rapid Transit System sells such a ticket at 10 pfennigs (2.5 cts.) for one-way riding or for 20 pfennigs (5 cts.) for a round trip. In the morning these tickets are valid only before 7 a.m., but the other half is good for a return at any time. The workmen's fare in Hamburg amounts to only one-third of the regular third-class rate in case the ride is into the last fare zone.

On the rapid transit lines where the two-class system obtains, the tickets are good on the third-class cars within the time restrictions noted (only second- and third-class cars are run). On European surface lines the single-class system is usual. In exceptional cases, as at Liverpool, a fare exceeding the normal rate is charged on a higher-class car.

Many Canadian electric railways sell workmen's tickets under various restrictions as to time. The Saskatoon Municipal Railway sells workmen's tickets at eight for 25 cts. In the morning these tickets are good only between 6 and 8 o'clock.

The Edmonton Municipal Electric Railway sells a brown ticket at six for 25 cts. This appears to be a broader form of workmen's fare and is

evidently intended to encourage noon riding, for it is good between 12 noon and 2 o'clock, as well as during the hours of 6 to 8 a.m. and 5 to 7 p.m. Furthermore, this ticket is not good on Sundays or public holidays. The Moncton (N. B.) Tramways also have a workmen's ticket good during the noon hour. The a.m. and p.m. periods are 6.30 to 7.30 and 6 to 7 respectively.

United States electric railways also have workmen's rates, but to a far less extent than either European or Canadian railways. Usually such rates are granted because of franchise requirements entered into long ago when the profits from electric railway operation were, or were thought to be, greater than they are known to be at present. The idea of reduced fares for workmen has commended itself to some philanthropists, but the idea when analyzed will be found to be that these well-wishers believe that the railway company, not they themselves, should bear the cost of this philanthropy. The margin of profit on a 5-ct. fare on most roads is so small that the only way in which the average company could make a fare of less than 5 cts. for workmen would be to raise the fare above 5 cts. a proportionate amount to those who are not workmen. We shall have something more to say later in this chapter about the principles which should be involved in any case of reduced fares. For the present it is sufficient to say that distinctions in fares between "workmen" and "non-workmen" will probably never be general in this country.

Lower-class Cars.—The proposal has sometimes been made to operate a cheaper class of car at a lower rate of fare, particularly for miners and fertilizer workers. While this might prove a good move in pleasing the rest of the public, it should be remembered that it costs almost as much to carry a passenger in a cheap car as in a dear one. The difference in the first cost of the cars is very little when compared with the charges for track, line, power, platform wages, etc.

The best plan is to use the regular cars and fumigate them after every trip, if necessary. A few trippers should take care of the more fastidious but scarcer traffic.

Reduced Rates for School Children.—Practically all American electric railways carry children under four or five years free, and a few carry children up to twelve years for half fare. The tendency is to lower the age limit of free riders. For example, the Springfield (Mass.) Street Railway since May, 1912, collects fare for children more than five years instead of seven years old. Generally this privilege is accompanied by a rule such as that which the Twin City Rapid Transit Company adopted in 1913, namely: Children less than six years of age and not more than three in number may ride free, if accompanied by guardians; but they must pay full fare should they refuse to give up a seat on demand by a full-fare passenger.

A large number of railways also grant reductions to older school attendants and occasionally to teachers. Generally, this plan is limited to specified school travel hours and, in any event, for school days only. Sometimes individual tickets are sold, properly identified, as by color, or in books covering the travel of a school month or a semester. Students of private schools sometimes are not accorded this reduction, but in the case of students at business schools the New Jersey Board of Public Utility Commissioners on Nov. 12, 1915, decided that they must be carried at the school rate. The Portland (Ore.) Company has an exceptionally liberal provision in that its 3.5-ct. school tickets are also available for Sunday School riders.

The practice of the companies differs as to the days and hours when school tickets will be accepted for passage as well as the methods of distributing them. The following account describes the practice of the Jackson Light & Traction Company, of Jackson, Miss., and is perhaps as typical as any:

"The company distributes through the superintendent of schools and through the teachers in the several schools, certificates which every pupil who wishes to purchase school tickets must fill out before books can be purchased at the office of the company. Each teacher in the public schools is supplied with a number of these certificates, and pupils must apply to their teacher for one of these. The certificate states that the pupil is in regular attendance at the school and is entitled to the use of school tickets, which will bear the signature of both pupil and teacher. These certificates may be presented at the office of the company and entitle the bearer to a book of thirty-three rides for \$1. The books are issued exclusively for pupils attending public schools *where no tuition fee* is charged and coupons are accepted for fare only between the hours of 8 a.m. and 9.30 a.m. and 1 p.m. and 3 p.m. on school days only. Coupons are not good if detached from cover and the book is forfeited if presented by one other than original purchaser. If the book is lost it is not replaced or any allowance made thereon. The person to whom the books are sold must affix his or her signature in ink. Misuse of the book subjects the pupil to forfeiture of school-rate privilege, and the holder agrees for the purpose of identification to write his or her signature upon request of the conductor and to comply with all regulations which may be issued from time to time to prevent misuse of the school-ticket privilege."

As a rule, school tickets are limited in use to within thirty days from date of sale, and very often there is a maximum age limit, such as fourteen years, for the children to whom these tickets are sold.

Transportation of Policemen, Firemen and Letter Carriers.—Before the days of commission regulation many municipal employees were carried free. At present the practice is limited, in most cases to policemen,

and firemen. Most companies, probably, give free transportation to policemen in uniform when they do not exceed a certain number, say two, per car. A smaller number of companies have accorded the same courtesy to firemen, and a few only have made no charge to letter carriers. The theory at the bottom of this practice undoubtedly has been that these public servants would reciprocate for this transportation by rendering prompt service when needed. There has been the added reason, in the case of policemen, that the presence on a car of these officers of the law is often of assistance to the employees in suppressing disorderly conduct on the car. That free riding should be restricted to officers in uniform is apparent from the fact that the municipality of Kansas City, Mo., has found it necessary to provide a fine up to \$100 maximum for policemen and firemen who loan their badges to friends.

The letter carriers deserve the least consideration, of course, because a street railway company has no grant and obtains no favor from the national government. For the convenience of the government some railway companies have made an agreement to accept a lump sum for the transportation of carriers while on duty. Such a plan is followed by the Public Service Railway, the payments being made quarterly and the amount being based on the estimated average number of rides taken by the carriers during each quarter. The mail bag is the evidence of the carrier's right to ride without paying fare, and the postal authorities require each carrier to leave his mail bag at his postal headquarters over night.

The present trend of public service legislation seems to be in the direction of cutting off all free transportation except to bona-fide employees of the company. This is a desirable step, because when once an exception is made for one class of municipal officers it is difficult to draw the line. This tendency is illustrated by an order issued July 3, 1916 by the Public Utilities Commission of Colorado making the furnishing or acceptance in that State of free or reduced rate transportation over any public utility by anyone not an employee punishable by fine or imprisonment or both.

Owl Car Fare and Service.—Owl, hawk or "wee sma' hour" service is a distinctive feature of American electric railway service as compared with European roads. Even in a city with so noted a system as Glasgow, service during the early morning hours was not contemplated until late in 1914. The explanation is the very simple one that such service seldom pays, even if double rates are charged. Among the roads which charged a 10-ct. fare on owl cars in 1916 were those in Des Moines, Little Rock, Lincoln and Ottawa. Even at these fares the companies reported the service was not profitable. As to the larger systems, the Public Service Railway, Newark, N. J., gives a 30-min. service on many of its

lines; the Philadelphia Rapid Transit Company gives in the downtown district a 10-min. schedule up to 1.30 a.m., while the Detroit United Railway operates 10- to 40-min. headways between 12.20 and 5.20 a.m.

All that can reasonably be demanded of the small city railway and of most interurbans is that they take care of the late theater traffic and special events.

Free Riding for Employees and Others.—Before the welcome anti-pass laws came the electric railway like the steam railroad was burdened with free transportation for every class of politicians, newspaper men and their friends. To-day these abuses have been measurably reduced but plenty of free and near-free riding remains.

First in order is free riding by employees. Of course, there is no question that those classes of employees who are obliged to travel about frequently on company business might well have unlimited free transportation, as such a plan is usually simpler from an accounting standpoint than if they rendered expense accounts for such traveling, and there is little chance that the practice is open to abuse. It is also quite common for companies to grant to all regular employees two rides a day to take them to and from their work and in some communities four rides per day are allowed where it is practicable for the employees to go home for lunch. The rub comes when free transportation for private purposes is considered as a matter of right and not as something to be reckoned as part of the wages.

An interesting light on the last point is cast by the opinion of the arbitration board which in 1913 sat in the proceedings between the Boston Elevated Railway and its employees. It was the opinion of the board that employees engaged in the company's business should be carried free or have their fares refunded. It did not favor further privileges for then free riding became a part of the wage, thus creating a discrimination unfair to those employees who lived within walking distance of their work.

A notable tendency to restrict this class of travel within business bounds is a rule of the Georgia Railway & Electric Company adopted Jan. 1, 1915. Uniformed men travel free but others pay fare subject to refund if on company business. For more than twenty years the officers and employees of the company had ridden free almost as a matter of course. Within a short period antecedent to the present change a distinction had been made in the kinds of tickets issued to the employees. Ticket books of a certain color, not renewable before a certain date after issue, were distributed among the office workers, the theory being that they would ride to and from home a certain number of times per month but would not travel for the company upon business. Ticket books of another color were issued to others connected with the company whose duties might require them to ride often on the company's affairs. These latter books

were renewable at any time. Investigation developed that the pass books issued during the year had attained an astonishing value figure. Thereupon the practice was ended, even the directors surrendering their passes.

As is pointed out elsewhere, free riding for employees may sometimes be a legitimate form of extra pay or welfare work for the meritorious. To give transportation indiscriminately to all employees and even their families is to make a large financial sacrifice without an adequate return in good will.

The second class of free transportation is that to newspapermen and politicians, assuming that no anti-pass law exists. As to the former, the only businesslike arrangement is to insist that the railway is entitled to payment for transportation just as the newspaper is entitled to payment for advertising. Even the village paper will prefer cash to rides as payment for advertising. As to politicians, the rule should be equally sweeping. Apart from the ethical nature of the question, it is impossible to carry free everyone who is influential in state and municipal affairs, and if some are favored and not others, invidious distinctions will be drawn. It is better to cut off all passes of this kind, and this is decidedly the tendency of the day.

Charity Rides.—Different practices obtain with regard to free riding for inmates of charitable institutions. In Pennsylvania the law against passes was construed as follows in November, 1914, by the Railroad Commission of Pennsylvania when it was asked to express its opinion whether a transportation company may lawfully grant free passes to charitable organizations:

"As we have heretofore had occasion to point out, in connection with similar questions relative to the subject of free transportation, the constitution of the Commonwealth, in Article XVII, Section 8, expressly provides that: 'No railroad, railway or other transportation company, shall grant free passes, or passes at a discount, to any person except officers or employees of the company.' So long as this prohibition remains as it now stands in the constitution, the commission is powerless to hold that free transportation may be issued to a charitable organization for charitable purposes, however much we might otherwise be in accord with a public policy which would permit of such free transportation in this class of cases."

In April, 1914, the Pennsylvania commission ruled against free or reduced-rate transportation for members of the clergy.

In Massachusetts, on the other hand, exceptions are permissible. In August, 1914, after public hearings, the Massachusetts Public Service Commission issued a memorandum defining the general limitation of free or reduced-rate service by steam railroads and street railways for

charitable objects. The memorandum said that the exception to the general prohibition should be limited to needy classes, such as the inmates of hospitals, of homes for the aged, of orphans' homes, day nurseries, mothers' outings and other undertakings for the relief of those unable to pay from their own resources. Contrariwise, trips for school children, Sunday school picnics, outings of athletic associations and clubs, and other similar purposes, which were mainly for pleasure and are not intended primarily to relieve any real suffering or need, were not charitable purposes to which the carriers ought to contribute by granting a free or reduced-rate service not available to the general public.

The foregoing declaration followed a statement made in May, 1914, by the Boston Elevated Railway that the company would discontinue free service to charitable organizations, fresh-air funds, Sunday schools and churches. The statement was in response to a request made on the subject by the commission in order to define what constituted charitable purposes.

The distinction drawn by the Massachusetts commission is certainly very sensible and is one that might well be borne in mind by electric railways when they are asked to favor some particular organization. However, if the company can afford to do so it is a fine thing to conduct occasional excursions to the needy, such as the annual orphan's outings of the Montreal Tramways and the tenement folks' trips to Bronx Park of the Interborough Rapid Transit Company, New York. Free riding for the needy blind is granted on a number of English tramways.

Fractional Fare Increases and Modified Zone Systems.—On some systems, as already noted, it has been found necessary to raise the unit fare from 5 to 6 cts.

Sometimes it is not practicable to charge multiples of 5-ct. fares on suburban lines in which event fractional increases are made. Thus for a number of years a single 5-ct. rate was charged over the entire system of the Chicago & West Towns Railway. In 1914, however, the fare on the suburban line was increased to a maximum of 10 cts. However, to regular riders beyond the 5-ct. limit at Riverside several forms of commutation tickets are issued. These are furnished as ten rides for 90 cts., twenty-five rides for \$2 and sixty-ride monthly individual tickets for \$3. In order to provide for those passengers living between the end of the line and this 5-ct. fare limit, a 7-ct. single fare is charged from points midway between the 5-ct. limit and the end of the line. Commutation rates are also available to regular riders from the intermediate points, the lowest being 5 cts.

A 7-ct. fare is also charged by the Hudson & Manhattan Railroad to those traveling on one of its longer routes, the minimum fare being 5 cts. The passenger from New Jersey buys a 5- and a 2-ct. ticket. He deposits

the first in the ticket box at the entrance station and the second in the ticket box at the exit station. When traveling from New York to New Jersey both tickets are dropped in the box at the entrance station. For the fiscal year May 31, 1912, which followed this innovation it was found that the average revenue per passenger had increased from 5 to 5.25 cts., and that travel in general had not been injuriously affected by what the public knew was a necessary raise in rates.

The most radical departure, however, is that of the Milwaukee Electric Railway & Light Company, which, beginning Jan. 18, 1914, was permitted to increase fares as follows, leaving the rates within the central district in Milwaukee undisturbed.

Prior to Jan. 18, 1914, the rate of fare beyond the single-fare limits of Milwaukee was 5 cts. cash into and through each subsequent 5-ct. zone, these zones being of irregular shape and giving, consequently, many causes for complaints of discrimination. There were also commutation tickets, the effect of most of which was to reduce the rate for these two zones from 10 cts. to $7\frac{1}{2}$ cts. a ride.

By the order of the commission all of these outside zones were abolished and, beginning from the city single-fare limits, the suburban territory was divided into zones of approximately 1 mile each and a fare of 2 cts. is charged for the ride into or through any such zone if it is a part of a longer haul, the minimum fare being 5 cts. The central or 5-ct. zone is about $8\frac{1}{2}$ to 9 miles in length and 6 miles in width and conforms substantially, though not exactly, with the city limits of 1914.

Under the plan of operation suburban passengers outbound from Milwaukee pay, on entering the car, a city ticket or 5 cts. cash. On leaving the car they deposit in the fare box 2 cts. cash or a 2-ct. zone ticket for each zone into or through which they travel. The zone limits are at well-established points, making it easy for passengers to distinguish the zones and leave the car at the point nearest their destination. Suburban passengers inbound to the city pay to destination as they enter, using cash or zone tickets in connection with city tickets if they desire. If a city fare is paid, transfers are issued to any city line if requested when the fare is paid. Passengers desiring to ride in suburban territory pay only 2 cts. cash or a zone ticket for each zone into or through which they ride, the minimum cash fare being 5 cts. for any suburban ride. As a concession to frequent riders a 330-mile coupon book is sold for \$5.40 with a minimum tear of 5 miles.

By a further order of the Commission, issued November, 1914, the 2-ct. tickets may be bought at the rate of thirty for 50 cts. About one-half of the riders use such tickets.

INTERURBAN FARES

One-way and Round Trip Interurban Tickets.—On interurban railways, of course, the one-way ticket represents the highest rate of fare except where a penalty is charged for paying on the train in cash. Round trip tickets are generally sold at a slight reduction, but in line with other fare advances the tendency for every-day riding is to make no reduction. For example, the Union Traction Company of Indiana discontinued such reductions early in 1915. Like steam railroad tickets they should have a reasonable time limitation more for the sake of convenient audits than to impose restrictions on the passenger.

Mileage rates vary greatly, ranging from less than 2 cts. per mile to 3 cts. The latter rate is more common on western light-travel lines. The 1-ct.-a-mile idea has been side-tracked for good in these days. A rate of 1.75 cts. per mile ought to be the minimum on all but very densely traveled lines. Most electric railways charge less per mile for passenger transportation than their steam rivals. In the past there has been a feeling on the part of electric railway managers that such lower charge was necessary to get the business.

Mileage Books.—A very common form of selling transportation on interurban lines at slightly reduced rates over the regular one-way fare is the mileage book. This is similar to steam railroad practice except that 500-mile books are more frequent due to the shorter average length of ride on interurban railways. It is proper to put a time limit on mileage books inasmuch as reductions ought to favor frequent patrons. A year, the limit set by the Albany Southern Railroad for its 500-mile book, is certainly more than generous.

Each road also specifies the minimum number of coupons, that may be presented for a ride. Commonly, this is placed at some multiple of 5 cts. which is just a little in excess of the per mile rate.

On some lines the use of mileage is restricted to one person only or to his family; in others it is available to any holder. However, a railway serves its interest best by encouraging the use of mileage rather than restricting it. The possession of a mileage book is a good inducement to riding, and while there is the cost of production against them, the company enjoys the use of the money received from their sale until the mileage is used.

The C. E. R. A. Mileage Book.—A number of the interurban railways which are members of the Central Electric Railway Association have an interchangeable 1000-mile ticket which is good over their lines, comprising many of the principal railways in Ohio, Indiana and Michigan. The book is sold for \$17.50, or at the rate of 1.75 cents per mile, and is good for bearer or bearer and party. It is valid for one year, and no detachments

are made for less than 5 miles for each passenger. No half-fare detachment is made on the ticket, and it is not honored for city fares. Baggage up to 150 lb. in weight and not exceeding \$100 value is checked on the mileage book.

Commutation.—While mileage limited to six months or a year is most suitable for the business drummer who travels between different points of the line, commutation between fixed points, namely, the work place and the living place, is most suitable for the daily rider. Commutation is commonly sold for so much below other fares that, unlike mileage, it should be carefully restricted to the individual named on the book.

A few exceptions are made, as in the case of the Puget Sound Electric Railway which sells commutation at 30 per cent. below the 2-cts.-a-mile rate good for the wife as well as for the husband. Equal suffrage indeed! This company also limits the commutation to sixty days, but the more common limitation is a calender month or simply to the week-days of the month.

The Union Traction Company of Indiana sells commutation at $1\frac{1}{4}$ cts. per mile which is approximately $\frac{3}{4}$ ct. per mile less than its standard mileage rate.

The commutation book of the New York State Railways—Rochester Lines—may be quoted extensively as an example of recent practice. Effective Jan. 1, 1914, this system filed a tariff with the Public Service Commission, Second District, State of New York, calling for fifty-four-trip commutation fares. When sold by agents, punch marks indicate the stations between which the tickets are to be used, as well as the time limit or expiration date.

The fifty-four-trip commutation books are sold under the following conditions:

Transportation is good only for the individual use of the person named on the cover of the book, and whose signature is affixed hereto. Otherwise the book will be forfeited.

The book is good only for fifty-four trips, if used between stations punched and from date of purchase to and including expiration date indicated by punch marks on coupons. No stop-over privileges are allowed.

The book must be presented to the conductor, who detaches one coupon for each ride, until the coupons are exhausted, or the time limit has expired. The book is to be surrendered to the conductor or company agent after the expiration of the time limit, whether all coupons have been used or not.

No baggage is checked on this book. Unused commutation books are redeemed by charging full tariff fare for the number of trips made, and

the difference between this amount and the original cost is refunded to the original purchaser.

Interurban Ticket Books.—In addition to or as a substitute for mileage some railways sell books of reduced-rate tickets with few or no time limitations. Thus the New York State Railways sells a book with 600 1-ct. coupons for \$5 good for one year from date of sale on all non-city points of the Rochester lines.

Copper Zone or Mileage System.—It was perfectly natural for the early electric interurbans to use the 5-ct. or nickel zone as a basis for fares. More and more, however, it has been recognized that for such lines the fares ought to be on a cents-per-mile basis. When the 5-ct. zone is used, all sorts of difficulties arise from overlapping, particularly on lines which make stops at more than one place in the intervening towns. The man who rides from Hohokus to Pumpkinvale feels that the last nickel paid ought to take him beyond the Court House to the general store. But if the company makes the general store the zone boundary it arouses the protest of riders from the opposite direction who want to go to the Court House. Unless there are natural boundaries for the zones the simplest plan, so far as the passenger is concerned, is to charge him on the interurban sections according to mileage traveled, with perhaps a proviso that where the fare is not a multiple of 5 cts. an additional amount must be paid so that the fare charged will be the next multiple of 5 cts.

When the Public Service Commission of Indiana on Nov. 21, 1914, granted the petition of the Union Traction Company of Indiana to establish 1-ct. or "copper" zones instead of 5-ct. or nickel zones, the company was authorized to file a new schedule of passenger tariffs, which put into effect on its lines in Indiana rates practically approximating 2 cts. a mile for the distance actually traveled; provided a minimum fare of 5 cts. and gave due consideration to competitive fares, lowering its fares to correspond in such circumstances. The order of the commission provided that fares shall be computed as follows:

"At the rate of 2 cts. a mile for the distance actually traveled, as nearly as practicable, a half mile at 1 ct. each to be taken as the unit. In the case of fractional miles from 0.75 (regarded as 0.8) of any mile to 0.24 (regarded as 0.2) of the next mile, both exclusive; fractions shall be disregarded, and the intervening whole mile regarded as the distance. In the case of fractional miles from 0.25 (regarded as 0.3) of any mile to 0.74 (regarded as 0.7) of the same mile, both inclusive, the fractional distance shall be regarded as $\frac{1}{2}$ mile, and the total distance shall be taken as the number of whole miles and one-half. For instance, any distance from 5.3 miles to 5.7 miles, both inclusive, shall be regarded as 5.50 miles, and any distance from 5.8 miles to 6.2 miles, both inclusive, shall be regarded as 6 miles. The minimum fare shall be 5 cts. and due consideration shall be given to competitive mileage of steam or other electric railroads."

This system was adopted on Jan. 1, 1915. On May 15, 1915, it was

inaugurated by the Terre Haute, Indianapolis & Eastern Traction Company and about the same time by the Indianapolis & Cincinnati Traction Company.

The first Eastern system to adopt the copper-zone system is the Shore Line Electric Railway, Norwich, Conn. It was established on the company's trackage between New London and New Haven in September, 1915. The duplex ticket used is of particular interest. It is described in the chapter on "Fare Collections and Devices."

Week-end Rates.—An English importation is the week-end ticket. This is worth more examination by American companies operating to beach and country resorts than it has received. If the week-end travel is below normal it is worth some nursing to bring up to car-capacity dimensions, but it could hardly be called good business to buy equipment for Saturday and Monday use at reduced rates of fare.

In general this should be the principle which should guide in the establishment of reduced fares at certain times, namely they are justified only when they increase traffic at periods in which otherwise travel would be light and thus act to equalize the passenger load on the system. We have already shown that peak hour travel is expensive to a railway; hence, it would be better, if any variation in rate of fare is to be made, to charge the higher fares during the rush hours and the lower fares in the middle of the day and at other non-rush hours. The same principle applies, of course, also to week-end excursions.

Canadian companies give week-end rates quite generally. Among the few United States companies which do are the Northern Electric Railway, Chico, Cal., extending north from Sacramento, and an Iowa company. The latter, reporting in 1908, stated that it had a large number of patrons whose homes were in Clinton or Davenport, but who worked during the week at the opposite end of the line. To induce these people to travel once a week at least the company gave a \$1 round trip fare between terminals on all Saturdays and Sundays. The regular round trip fare was \$1.20. This reduction also induced traffic from people who took the opportunity to make Sunday calls and visits.

A reduction to the \$1 round trip rate was also made on other holidays and whenever there were any special features at either end of the line. The company could not state positively whether this reduction brought any material increase in the last class of traffic, but it thought the difference between \$1 and \$1.20 was enough to attract a great many people who otherwise would stay at home.

Reduced Fares for Evening Riding.—In 1914, the Southwestern Traction Company, Temple, Tex., had a schedule of reduced rates applying between Temple and Belton and intermediate points for all travel occurring after 6 p.m. The through rate from Temple to Belton and

vice versa was reduced from 25 cts. to 15 cts. and reductions between other points were made in proportion.

Holiday Rates.—It is established practice, of course, to give reduced rates for holiday excursions as this is often the only way to bring out some classes of the public at all. When some companies make reduced round trip rates to a pleasure resort containing various concessions or pay attractions, the return half of the ticket must be validated within the park or else exchanged for a stub entitling the holder to return without further payment of fare. Such a plan encourages the profitable use of the park, but what may be more important in some localities, it prevents the use of reduced rate tickets by business riders.

There is no good reason, however, why the rate should be made still lower when tickets are sold to parties of riders like clubs, lodges, etc. If anything, the rate should be on a chartered-car basis and fairly equivalent to what the company would earn with an excursion car filled to capacity. The Newport News & Hampton Railway pays a 10 per cent. commission to the organization which conducts the excursion. In this case the special fare per passenger is the same as an individual would pay (20 instead of 30 cts.) except for the discount to the organization.

Excess Fares.—An excess fare of 5 or 10 cts. is often charged if the passenger offers cash fare on the train. The idea is partly to discourage him from repeating and partly to get a check on the conductor since by making the receipts redeemable for the excess fare the passenger is induced to turn them in. The excess fare, however, may be omitted for fares of 10 cts. or less as is the practice since August, 1914, of the Buffalo & Lake Erie Traction Company.

Extra Fare Trains.—Although most interurban railways operate limited as well as local trains, very few make any extra charge for the service. Some of the larger systems operate chair cars and on these, since the capacity is reduced, an addition of 25 cts. or more according to distance is properly made.

CHAPTER IX

FARE COLLECTION PRACTICES AND DEVICES

In the years just preceding the now almost universal prepayment era, the conductor usually collected fares directly by hand in any part of the car and registered them on a stationary register with figures which were large enough to be seen and a gong which was loud enough to be heard by any passenger.

The chief exception to direct-hand collection was that many Canadian lines used, and still use, a non-registering box, popularly called a "coffee-pot," into which a passenger dropped his fare after securing change from the conductor. The use of this box was promoted by the Canadian practice of selling fare tickets in the form of strips at six for 25 cts. Hence, had the ticket been handed directly to the conductor, he would have been tempted to turn in the $4\frac{1}{6}$ -ct. tickets for straight 5-ct. fares and pocket $\frac{5}{6}$ ct. for every cash fare so converted.

In Providence and a number of other cities a compact hand register with coin-release following registration was also in successful service before prepayment; and the same register is in equally successful use today on prepayment cars in Providence, Binghamton and a number of other cities in this country as well as on the Fifth Avenue buses, New York. The principal objections urged against this type of register are, first, the difficulty of issuing transfers and, second, the possibility that the machine can be stolen and circulated among different conductors. The first objection is a valid one on any system with a large proportion of transfer traffic, quite regardless of the method of fare collection. So far as the second objection is concerned it is but fair to say that some ten years experience have developed but one case of this kind. A conductor of the Fifth Avenue Bus Company who was found to have a duplicated register was fined \$1,500 and sentenced to 1 year in prison because wilful intent to steal was proved.

While the usual practice on cars still operated without prepayment is to register fares as paid, the Brooklyn Rapid Transit System instructs its conductors to ring up all fares before collection on runs from the New York end of the Brooklyn Bridge. This rule to accelerate collection is practicable because the outgoing cars have a mile run over the bridge into Brooklyn before entering any passenger interchange territory. If the conductor fails to get all fares before reaching the other end of the

bridge an inspector may authorize the car to stop until he does. However, this action, which would naturally slow up the service, is not often required since the rush-hour cars go more slowly over the bridge than those during non-rush hours.

Should Transfers be Registered?—While cash fare collection and registration practices were once quite uniform on American railways, the latter were and still are divided into two camps with regard to transfer accounting. Some companies register transfers as cash fares, some not at all, while others register them on separate registers, each operated by means of a differently colored rod or cord.

The objection to registering everything on one register is that conductors can turn in too readily in place of cash, transfers which they pick up in the car or secure by trading with conductors of intersecting lines.

The objection against non-registration is the difficulty of checking register readings against passenger count and, even with an inspector present, of determining every time whether a non-registered fare is cash or transfer. Furthermore, since the management acts as if the transfers are of no value, it cannot expect the conductors to exercise great care in issuing or accepting such transfers.

The use of separate registers for cash and transfers, or of a cash and a transfer dial in one register is really the most practicable scheme since it accounts directly for each large class of passengers in the car. The use of two registers also has a good moral effect because the conductor knows that both passengers and inspectors can see whether his fare was correctly recorded. The transfer register should have a different-sounding gong to prevent cash being registered as transfers. It should also be used for recording passes or other tangible evidence of non-cash riding. Where employees ride on a pass or a badge, the conductor makes an entry of the number on his trip sheet, thereby squaring himself against any count made by uniformed or secret inspectors.

In some recent devices the cash and transfer registering mechanisms are in one housing as hereinafter described.

Blind and Open Registers.—In 1911, out of 116 railway companies which reported to the Transportation & Traffic Association, only five city and ten interurban lines operated "blind" registers, namely, the totalizer of the registers was covered and only the trip total was shown. Although in theory the conductor should be more careful where blind registers are used, the fact that their users found plenty of overs and shorts indicated that the scheme was worth little as a cautionary measure. Furthermore, the conductor is justified in objecting to a device that might go wrong without his knowledge. The plan is very rarely used in city service and is desirable only in exceptional circumstances and then

only when the care given to register maintenance insures absolute reliability of their correct working.

Passenger Movement in Fare Collection.—In most of the earlier prepayment cars the conductor stood on the rear platform, which sometimes was vestibuled, sometimes not. Then came the pay-within type with fully vestibuled platforms but no bulkhead doors, thus allowing the conductor to stand in the body of the car. The pay-within car permitted a larger load to be taken on the platform at one time and gave the conductor better control of the incoming travel than where passengers could slip in behind him through a rear-exit door in the bulkhead. The fact that passengers cannot leave or enter the vestibuled car while it is in motion has also been a big factor in making it the characteristic prepayment car of the day.

In both types of prepayment cars the exit at the front is under the control of the motorman. In the rear-side prepayment car all entrance and all exit, except emergency, is at the front and under the control of the motorman. The conductor formerly collected fares on the platform, but to decrease congestion and keep him from too much intercourse with the motorman he now collects fares while standing in a niche formed by omitting an end seat. His control over the incoming travel is therefore not quite so good as in the rear-entrance pay-within car where the conductor stands in the middle of the aisle. Further, he is not in a favorable position to prevent clandestine entry at the rear when the latter is opened for heavy travel.

The center-entrance car used in New York places the conductor in a side cage which he cannot leave to control traffic movement. In other center-entrance cars the conductor stands on the floor and is free to move, but still finds it hard to prevent interlopers from passing him at times.

The Pittsburgh side-door car has three separately operated doors, two of them being located in the middle of the car and one in the front right-hand corner. Passengers in the front half of the car use the front corner door for exit. Those in the rear of the car use the rear center door for exit, and the front center door is used for entrance in case the other two doors are busy. As soon, however, as any parties desiring to alight have alighted from the rear center door, it is also used for entering passengers. Hence the conductor, who stands just behind the fare box in the center of the car, collects fares from two streams of passengers.

In 1915 the Association committee on fares and transfers reported that the front-exit door and separate operation of the center doors, which enable the conductor to guide passengers without saying a word to them, had greatly speeded Pittsburgh fare collection. If somebody rings the bell in the rear of the car, indicating that he wants to alight at the next

stop, and there are a number who want to get on at the next stop, the conductor keeps the rear center door closed until the passenger desiring to alight is standing immediately at the door, when he opens it, permitting the passenger to leave. This obviates the necessity of the conductor calling to the passengers to wait until the passengers have alighted, and also obviates the necessity of printing instructions on the outside of the car, asking that boarding passengers wait until people have alighted, etc. The front-exit door is also used by the conductor when he leaves to signal the car over a steam crossing.

Pay-as-you-leave Operation.—An interesting development is the Cleveland Railway's combination near-side entrance, center-exit, post-payment car. In this car the fare box and conductor are beside the center-exit doors, so that the front entrance loading area embraces practically one-half of the carbody in addition to the vestibule. The arrangement permits loading the maximum number of passengers without the delay incident to collecting fares on the platform. At the same time the usual jostling of ingoing and outgoing passengers on center-entrance cars is eliminated, while the center exit assures quick alighting provided that the postpayment passengers have exact fare ready. A plan of this car is given in Fig. 50, page 127.

The car was designed originally for cross-town line service. In Cleveland some cross-town lines intersect as many as twelve main trunk lines within a distance of less than 3 miles, and this makes transferring passengers the principal business of the cross-town lines. This service involves the movement of many passengers at each transfer point, and it is important that they should be encouraged to move quickly.

Since all stops on cross-town lines are on the near side, the reason for the adoption of the front-end entrance is obvious. Past experiences also have shown that even with the roomy platforms, as are used on Cleveland cars, the number of transfer passengers picked up at any intersection is so large that they cannot be handled without considerable delay. However, with the enlarged loading area provided by the pay-as-you-leave system that is applied to the front half of the new car, this delay is obviated.

The car is for single-end operation in accordance with Cleveland practice. The clear width of the front entrance with the folding doors open is 40 in., sufficient to permit two passengers abreast to board at one time. Stanchions flanking each side of this opening encourage the rapid movement of boarding passengers.

The clear width of each of the two center-exit doors is 33 $\frac{3}{8}$ in. Stanchions on each side of this opening and one at the center are installed on the second step, while two more stanchions are located inside the car. Partly as a means for getting passengers to occupy the rear of the car, twelve cross seats and a semicircular seat in the rear vestibule were

provided, as it was believed that the passengers would avail themselves of vacant seats in the rear end of the car before the longitudinal seats in the front would be occupied.

All passengers who want seats in the rear of the car pay their fares as they move by the conductor's stand. Passengers remaining in the front half of the car and occupying the longitudinal seats, however, are not required to pay their fares until they approach the center-exit doors to alight. In consequence, all the advantage of the center-entrance car in shortening the movements of alighting passengers is afforded and an increased loading area is provided, thus tending to eliminate congestion incident to collecting fares at the entrance.

Cars of this type have recently been completed for a number of other Ohio cities as well as for Rochester, Syracuse and Utica. Hence railway men will not have long to wait to see whether the combined prepayment-postpayment plan will be a success under widely diverse conditions.

Another practice in Cleveland fare collection is that of pay-as-you-enter on inbound cars in the morning and pay-as-you-leave on outbound cars at night. In the latter case the passenger enters at the front and leaves past the conductor at the rear. Evidently this scheme avoids any possible loading delays due to prepayment while it still insures the collection of every fare.

Pay-as-you-leave at Terminals.—Of course, pay-as-you-leave practice at inclosed terminals is an earlier development. Thus on the Hudson & Manhattan Railroad, New York, as has been described, a 5-ct. ticket is deposited when the passenger enters the train in New Jersey and he gives up a 2-ct. ticket at the station of departure in New York, if it is within the 7-ct. zone. Again, at the Coney Island terminals of the Brooklyn Rapid Transit lines a second fare is collected from all passengers who have no conductor's receipt to show that they entrained within the 5-ct. zone.

Front-end Fare Collection on the Street.—The prime object of front-end fare collection on the street is to speed up car movement, as described in the chapter on "Accelerating Traffic Movement Along the Line." From the fare collection standpoint it has the weakness of injuring the check on fares collected, since the type of registers used by these front-end collectors does not show the car for which the fares were taken. A neck register to be used by a street collector which showed the fares collected per car would greatly encourage railways to make more use of front-end fare collection for its traffic-speeding value.

The Kansas City Railways have adopted a plan in connection with front-end fare collection which gives a check on the transfers issued by front-end collectors, even if there is no separate check on the fares collected per car. This plan is to provide such collectors with a special transfer marked "front-end collector" and carrying the names of the

forty-three boarding points where front-end collectors are customarily employed during rush hours. Before beginning his work the collector punches the point at which he is stationed, and the conductors on any line where the transfer may later be used have then only to note that the passenger is not being carried back to his starting point. This plan of having a standard transfer for the front-end collectors is simpler than when the collector has to use a different transfer for each line and is estimated to save from four to six seconds per car at each congested boarding point. In July, 1916, the front-end transfers constituted about 2 per cent. of the 6,000,000 to 7,000,000 transfers issued monthly by this company.

Beginnings of Prepayment Devices.—When the prepayment system was introduced at Montreal in 1905, the non-registering "coffee-pot" fare box was retained. Instead of carrying the box in his hand, however, the conductor could now rest it on the platform dividing rail at a point where the passengers could insert their fares most conveniently.

The Montreal scheme was not followed by American companies when they accepted the prepayment principle, except for the partial adoption of non-registering boxes. Indeed, changes in fare-collection devices came fast and furious. One of the first was the addition of a pedal mechanism to enable the conductor to operate the register with his feet while his hands were free to collect fare or handle transfers, and then came the variety of fare boxes and registers which will now be briefly described.

Fare Boxes.—The first fare boxes devised for prepayment service were of the safe or compartment type. These boxes extended to the floor, were clumsy to handle, were slow fare collectors and took too much platform space. As they did not return the money to the conductor for change they placed upon him the unreasonable burden of carrying \$10 to \$25 in cash. One of the worst drawbacks of these big boxes was their rapid destruction, as they were too heavy and awkward to be carried from one end of the car without excessive dragging and bumping. They cost the railways a lot of money and were quickly discarded.

By 1912 experiments and experience had demonstrated to certain roads that had been using fare receptacles which handled 5-, 10-, 25- and 50-ct. coins that a single- or perhaps a double-compartment fare box was better. The single-compartment box was more easily handled, cost less for repairs and simplified the checking of car receipts in the accounting department. With the single-compartment box the practice followed was to give a conductor a fare box with a movable cash receptacle as he was assigned to a car. This box he would use throughout the day, after having deposited an identification slip therein. If a man were relieved temporarily as for meals or swings, he would remove the fare box from the car and leave it with the receiver or clerk at the carhouse until

he resumed his work. At the close of his day the cash receptacle would be removed from the box and sent to the cashier, an empty receptacle being put in its place.

In spite of this discarding of the multiple-coin and compartment box some inventors still cling to the idea that a fare box should register many denominations and make change like a store register. They ignore the fact that every extra service adds to the cost, weight, dimensions and delicacy of the device. It is enough to register the two or three classes of cash and ticket fares that a city railway is forced to handle without adding needless complexities. Instead of having the box make change for, say, 25-ct. fares, the passenger should be educated up to the point of presenting a nickel for fare just as he has been educated to keeping pennies handy for a newspaper or chewing gum. In any event, the conductor's hands are the best change makers. The ideal of the fare-box builder, approached in the motor-driven type, is a machine which registers the fare deposited as fast as the passenger can walk past the box.

Passenger Obligated to Use Fare-collecting Device.—The courts have decided in several instances that prepayment and other fare-collection regulations are reasonable. In January, 1911, the Supreme Court of Rhode Island¹ held that the regulations of the company were reasonable, even to the extent of declining to allow the passenger to place five pennies in the register. The court held that the advantage to the company of the registering device in simplifying its accounts and in securing accurate fare collection should meet with approval rather than condemnation, and that these advantages more than counterbalanced any slight degree of annoyance to the passenger incident to the use of the device.

The register in question was of the hand automatic registration type previously mentioned. It may also be considered as a registering fare box with coin release, as the money may be dropped into the conductor's palm immediately after registration. One advantage of this device on prepayment cars is that the conductor can take the initiative in singling out the passengers who are ready to pay instead of permitting a tardy one to delay the rest.

Locked Non-registering Boxes.—Some operating men prefer a locked non-registering box in connection with the standard form of register; but the fact that users of such boxes have found as much as 3 per cent. more cash in the box than was shown on the register is pretty good proof that it is better to combine the fare-collecting and registering functions in one device. Locked boxes are most appropriate where most fares are tickets sold at cut rates, thereby making it undesirable for the conductor to handle them, as on Canadian lines.

Several non-registering boxes have one space for tickets and another

¹ Joseph Martin versus the Rhode Island Company 78 A. 548; 32 R. I., 162.

for cash. The cash drawer cannot be inserted in the cabinet until it has been unlocked, and it cannot be removed without locking itself. Such boxes are designed with the intention of keeping a key to the cash drawer in the cashier's office, and a key in the cabinet in the hands of the carhouse man who removes the cash boxes from the cars.

The practice of the Fort Wayne & Northern Indiana Traction Company in using this type of box for city service to care for tickets and cash fares is as follows: The device for separating the tickets from the money consists of two boxes, one smaller than the other, the smaller box having holes at the bottom which will allow coins but not tickets to pass through. This box is then placed in the larger box and moved back and forth on rails placed on each side of the box and the coins drop into the bottom of the larger box. The upper box is then lifted out and the tickets are in one box and the money in the other.

Registering Fare Boxes.—A glance at the present fare boxes, both locked and registering types, shows what wonderful strides have been made in them within the last three or four years. They are so small that they can be placed on the dividing rail on the "pay-within" stand without interfering with the passenger and they are readily carried from one end of the car to the other. They register cash fares alone or they may include slots for tickets, transfers or metal tokens; they may include a complete fare register, thus eliminating cords and rods entirely; they permit inspection of and possible rejection of inserted coins more conveniently than the safes; their coin chutes are ingeniously arranged to make a "shake-down" of fares by reversing the box utterly impossible; they may be motor-driven, and their accuracy is beyond dispute.

The cost for maintaining one of the most prominent types of coin-counting boxes on one railway using about 1500, with means for 5-ct., 10-ct. and 5-pennies-as-a-nickel registration, works out to about \$5 per box per annum. Sad to relate, even the most modern box lacks the ability to persuade the passenger to drop the fare in the box himself instead of tempting the conductor by handing him the coin.

To one registering fare box has been added a registering mechanism which automatically counts two different denominations of metal tickets, as well as nickels, dimes and pennies on separate totalizers. The metal tickets, which are made in two sizes to serve for lines where two classes of ticket fares are in use, are counted and indicated on two different dials, while the cash fares, including nickels, dimes and pennies are totalized and shown on another indicator. The fourth indicator totalizes all fares collected and the three other indicators show the total passenger load divided into the three classes of fares collected. The counting mechanism for the four dials is so interlocked that it is impossible for any class of fare to be registered on the wrong dial. All fares are deposited into one

hopper and the counting mechanisms select the different classes of fares and indicate them on the dials.

Another of the latest registering fare boxes operates as follows: Cash fares and ticket fares are deposited in the same receiving box by the passengers, where they are examined by the conductor. When the handle at the front of the box is turned, the coins are separated from the tickets and the total amount of coin is computed in dollars and cents. After the coins are registered they pass into a coin till, where they are at once available for use by the conductor. At the same time the ticket fares, as they are separated from the cash fares, are cancelled and delivered into the ticket box from which they are removed at the end of the run or at the end of the day by an authorized employee. The tickets are counted by means of a separate register in the fare box, the registration being made by a small lever which is pressed as each ticket is deposited. A register bell indicates the completion of each registration. Means for registering transfers are also included if desired. This box reduces the chance of a conductor to trade cut-price tickets for full-price cash fares, but he could still drop a ticket in the box if an indifferent passenger handed him cash.

Combination Money-counting Fare Boxes with Fare Register Overhead.—

The recognition by register makers of the tendency to avoid double registration and obstructive cords and rods is manifested in recent combinations of fare boxes and fare registers, the register being mounted on a pedestal over the box. One of these devices registers coins, metal tickets and transfers. In addition to cash fare and transfer registers it has a mechanism for separately and automatically registering metal tickets. These metal tickets are deposited in the same hopper as the coins and are counted by the operation of the same crank that counts the coins. The transfer register is operated by a cord within convenient reach of the conductor.

In another combination of the same maker no metal-ticket register is used, but the transfer register is placed upon the top of the coin register which has a vertical pull cord. By turning a crank the register will show in dollars and cents the total amount of all cash fares, the large figures on the two registers showing the number of passengers on each half trip.

Motor-driven Coin Register.—The latest development of this maker is a motor-driven coin register, first used at Boston. This, too, is a fare box and overhead register combined. Instead of operating a crank handle to secure registration, the conductor tilts the coin table in such fashion that the motor drive causes a registration of each fare as fast as deposited. The box, as used on the cars in Boston, registers nickels and dimes only. Passengers are requested not to deposit pennies, but should

they do so, the pennies are separated from the other coins and go into a locked compartment to be removed later by the auditors' representative. The nickels and dimes are deposited in the conductor's receptacle and are available for making change.

The advantages of this motor-driven outfit may be summarized as follows: Impossibility of securing a fractional registration in place of a full fare (all non-current coins being trapped beyond the conductor's control); immediate return of fares for change; material relief of conductor from pulling register cords when he is busy as in rush hours; absolute check between money collected and money registered; effective inspection, as fares are rung up one by one when collected and not bunched later.

Fare Boxes with Multiple Recorders and Printed Record.—In the combination equipment of a second manufacturer, one may get a registering fare box and a multiple-fare recorder with printed record. All cash fares are deposited in the fare box and are computed and registered in the usual way. All fares, including cash fares, are also classified, indicated and registered on the fare-recorder mechanism to give a separate indication and registration for each fare collected, and to provide a classified printed record which is immediately available at the end of each conductor's period of work. The fares are classified and indicated by means of a small lever conveniently located on the recorder, and the registrations are made by operating a treadle.

A valuable feature of the combination fare-box recorder is the printed record made of the fare registrations. The register readings for each trip are taken on a card, approximately $5\frac{1}{2}$ in. wide by $7\frac{1}{2}$ in. long, provided on both sides with blank forms for additional traffic data to be filled in by the conductor. At the beginning of his work the conductor takes a zero reading on the record card to indicate the condition of the register, and then prints the record of the fare registrations for each trip in the order in which the trips are made. At the end of the run the record shows in cumulative amounts the number of each kind of fare collected, the amount in dollars and cents of the fare-box registrations and the "total register" readings. Thus by making two subtractions the itemized results of the fare collections are immediately and accurately determined.

The inevitable errors in footings and extensions in conductors' trip reports are entirely eliminated by this system of fare collection and recording, and the entire record is in the most convenient form for office handling, having all the advantages of the modern card system for checking and filing.

A printed trip record like this should be extremely valuable on one-man cars since the operator ought to have as little clerical work as possible. However, many operating men feel that so complex a mechanism with

blind registration is undesirable when both conductor and motorman are used.

Electrically Rung Register for Prepayment without Boxes.—Although fare boxes are finding wider favor daily, they are still absent where the management believes that the passenger can pay fare more quickly to the conductor than by a box. It is obvious that even if this plan does increase the speed of passenger boarding it places a heavy burden upon the conductor.

Bearing this fact in mind, the Brooklyn Rapid Transit System in adopting prepayment on its center-entrance cars retained the standard register but arranged it to operate electrically from a push-button in the conductor's change-making table instead of employing register rods or pedals. This enables the conductor to be freer to operate the center doors, to handle and register fares in the quickest and most accurate manner and to avoid the fatigue incident to ringing mechanically a large number of fares in succession. A cash register is mounted on the bulkhead at one end and a transfer register on the bulkhead at the opposite end of the car. When a passenger enters a car he places his cash or ticket fare on the change table or pedestal. The conductor slides the fare to one side and at the same moment taps the push-button which corresponds to the proper register. If but five fares are to be recorded at one time, it is necessary only to maintain pressure on the button until the register has rung five times. This device is timed to ring as high as 200 fares per minute. It is found that with a little experience conductors soon learn to gage instinctively the relation between the time of pressure and the number of registrations. A repeating switch limits the speed registration to any degree desired by the railway, but even at the maximum speed named it is impossible for a conductor to bunch his registrations. A heavy drop in voltage lowers the rate of registration, but not enough to be of any consequence.

Fare Collection on Cars via Turnstiles.—The turnstile has a justified vogue for station use in preference to employing a ticket chopper, but it is not likely to find a place on car platforms, although a few cars have been so equipped from time to time. Several very creditable designs have been invented, but experience shows that the fewer impediments on the platform, the better. There every inch is valuable, even the rails which divided entering from departing passengers having been removed on many cars as the public has become educated to prepayment operation.

Class-fare Registration in City Service.—Hitherto in discussing fare collection we have assumed only two classes of fares—the 5-ct. fare and the transfer. In city service these are usually the principal classes to account for. The small proportion of children's or workmen's half-

fares is often rung up on the same cash register, the conductor making a memorandum on his trip sheet of every such fare. As a rule, however, there is nothing to prevent him from putting down as 3-ct. fares as many 5-ct. fares as he thinks safe.

Still another, though more troublesome chance for speculation is afforded where tickets are sold at say six for 25 cts. Here the conductor can buy tickets and turn in $4\frac{1}{6}$ cts. for every 5-ct. cash fare. Then, too, the assertion that several people were riding on passes may get more than one dishonest conductor out of a scrape when his register and the inspector's count are at odds.

One answer to correct fare accounting under such a variety of conditions is to use either a duplex-ticket system or means for prominent separate registration and indication for each denomination of fare handled, whether cash, ticket commutation, mileage or free. These methods have been developed primarily for suburban and interurban fare collection but they are also available for city service.

The multi-fare or class-printing register, of course, is blind; that is to say, it does not indicate the total of all fares collected, the theory being that if a conductor rings up each fare correctly his proper turn-in will consist of all the cash in his pockets less the amount he started with for change.

One type of class register to cover 5-ct. fares, tickets, transfers and passes combines the following features: Indicates, records and prints; prints the hour and the minute each half-trip is begun, the date, the register number, the division or line number, the direction, the number of fares registered in each class and the total amount of cash collected.

At the completion of each conductor's run all printing counters are turned back to zero with the exception of the total passenger counter. This provides a check between the records of successive conductors, and between the closing figures of one day and the opening figures of the next.

The register cannot be operated unless the detail and total cash counters are previously turned to zero. The conductor then takes an imprint with his identification key in the register. His key is locked in the machine with the registration of the first fare, and it cannot be removed until he has taken a final imprint to close up his day's report. Neither can the conductor operate the register after he has turned the total passenger indicator to zero unless he takes an impression again.

As shown in Fig. 79, conductor No. 14 takes the car on Dec. 5 at 8.30 a.m. At the end of his first trip he has registered sixteen transfers, fifteen tickets, three passes and sixty-three 5-ct. fares, making his cash total \$3.15. At the end of his last trip he has registered seventy-two transfers, seventy-four tickets, sixty-eight passes and 247 5-ct. fares, making a cash total of \$12.35. Each trip impression gives a direct reading

of the fares registered by each conductor up to that time, and his work can thus be analyzed by the trip or by the day. The sheet also shows the work done by conductor No. 27 after which the record is closed by Inspector No. 8 at 4.23 p.m.

Experiences in Trying out Class Registers.—Where the class register is substituted in city service for the visible register some time is often required for the conductors to get used to the new system. This is particularly true in connection with the registration of transfers on systems on which previously transfers have not been registered. In cases of this kind the difficulty has been overcome partly by general talks to

TIME	DIRECTION	LINE No.	TRANSFERS	TICKETS	PASSES	5¢ FARES	TOTAL CASH	REGISTER NUMBER	TOTAL PASSENGERS	DATE	IDENTIFICATION
4 23P	L	18	0 0 0	0 0 0	0 0 0	0 0 0	\$ 0 0 0.0 0	5	7 4 7 0	DEC 5	INS8
4 23P	L	18	0 4 2	0 4 7	0 5 6	1 9 8	\$ 0 9 9.0 0	5	7 4 7 0	DEC 5	27
3 34P	O	18	0 3 5	0 3 2	0 3 6	1 6 3	\$ 0 8 1.5 5	5	7 3 9 3	DEC 5	27
2 25P	L	18	0 2 4	0 1 7	0 2 1	1 0 6	\$ 0 5 3.0 0	5	7 2 9 5	DEC 5	27
1 36P	O	18	0 0 7	0 0 9	0 0 8	0 5 0	\$ 0 2 5.0 0	5	7 2 0 1	DEC 5	27
12 27P	L	39	0 0 0	0 0 0	0 0 0	0 0 0	\$ 0 0 0.0 0	5	7 1 2 7	DEC 5	27
12 27P	L	39	0 7 2	0 7 4	0 6 8	2 4 7	\$ 1 2 3 5	5	7 1 2 7	DEC 5	14
11 27A	O	39	0 5 9	0 5 5	0 4 3	1 8 9	\$ 0 9 4 5	5	7 0 1 2	DEC 5	14
10 38A	L	39	0 3 4	0 3 4	0 1 6	1 3 8	\$ 0 6 9 0	5	6 8 8 8	DEC 5	14
9 29A	O	39	0 1 6	0 1 5	0 0 3	0 6 3	\$ 0 3 1 5	5	6 7 6 3	DEC 5	14
8 30A	L	39	0 0 0	0 0 0	0 0 0	0 0 0	\$ 0 0 0.0 0	5	6 6 6 6	DEC 5	14

FIG. 79.—Record from class fare register in city service.

the men by the superintendent upon the importance of careful registration, partly by individual talks with those men whose trip slip differed considerably from the record shown by the register and partly by posting the registration records of the men and thus inciting a rivalry for accuracy among them.

Fare Collection on Elevated and Subway Lines.—The usual method of collecting fares at stations and terminals of elevated and subway lines is through ticket agents and ticket choppers, two men being employed. If the traffic is not considered too heavy, the chopper is replaced by a turnstile or passimeter, which arrangement, of course, also dispenses with the need for tickets. Modern registering turnstiles on the Brooklyn Rapid Transit System have passed as many as 2200 people in 45 min. when each person gave up a transfer to an agent and passed on. Even in ordinary operation with cash payment a modern turnstile is faster

than the ticket chopper because a passenger can go through the stile faster than he can pick up his ticket and throw it into the chopper. The later turnstiles are built with flexibly mounted arms which makes them more agreeable to the passenger and less costly to maintain. In operating these machines during rush hours the agent may keep the turnstile unlocked so that the passenger is going through it practically at the moment he gets his change. The mechanism may be controlled by the foot, thereby leaving the agent's hands free to make change.

More recently, as on the Philadelphia elevated lines, the registering fare box developed for surface cars has been adapted to station service. During rush hours one man stays in the booth to make change for the passengers, who, in turn, drop a nickel in the box. Thus tickets may be eliminated, yet every fare deposited is recorded. During the lighter hours only one man is required. He stands at the fare box to make change and watch the box as on a street car.

Still another way used at Philadelphia is to station one man in the booth to collect fares and ring them up on a standard car register.

Change-making machines of the cash-register type are also available. While these are too bulky for car service they are worth considering for stationary collection points. Under the control of the collector, such machines will take 5-, 10-, 25- and even 50-ct. pieces if desired, making the correct change instantly for one or more passengers. Like the others, these machines may be arranged to return the cash to the fare collector immediately after registration.

On several rapid transit lines of the Brooklyn Rapid Transit System both 5- and 10-ct. fares are charged. The following ticket system is used to prevent over-riding: Riders who board the Brighton Beach line, for example, within its suburban zone between Prospect Park and Coney Island pay but 5 cts. and receive a receipt therefor. On reaching the beach terminal the suburban passenger shows and gives up his receipt while the passenger who started from a city station pays a second cash fare. On the return trip the passenger to any of the city stations pays 10 cts. and receives a receipt which is not collected until the 5-ct. suburban zone had been passed. Hence in this case the 5-ct. passenger receives no ticket, and if he tried to ride beyond the last 5-ct. station he would have to pay a second fare. On the Sea Beach line of the same company, the conductor himself collects all extra fares within the suburban zone from passengers who have entered the train from wayside stops where no ticket agents are provided.

Boston Elevated Practices.—The speediest collection system for rapid transit lines is that of the Boston Elevated Railway, in which the use of paper has been practically abolished. This system of straight-cash fare constitutes such an advance upon previous rapid transit practice

that it is well worth an extended description. The chief advantages as foreseen by the management may be summarized as follows:

Traffic at the stations would be accelerated because passengers would not have to stop to buy tickets. They would proceed directly to the car platforms, only a small fraction being obliged to stop for change.

Since passengers would be much more likely to have the proper fare, a given number of ticket sellers could be replaced by a smaller number of change makers.

Short-change disputes with passengers would be greatly reduced because they would go to the change maker only for an exact exchange, not for a transaction involving subtraction and the counting of tickets.

Accounting disputes with the station cashiers also would be reduced because the change maker simply would have to turn in exactly as much money as she received on beginning work. On the other hand, with the use of tickets, errors may arise from the duplication or skipping of serial numbers on the ticket reels. In this event, an honest ticket seller would get into trouble for turning in "overs."

Aside from these differences, the abolition of tickets would prevent collusion between the ticket sellers and the ticket choppers and would make it impossible for the ticket sellers to substitute transfers for cash fares.

Losses from the palming of money would be trifling, as a coin, unlike a ticket, makes a noise when it strikes the hopper. A wrong coin would be detected more easily than a crumpled counterfeit ticket.

There would also be a material saving from the elimination of tickets and the reduction of station forces.

Development of Non-ticket System.—The company decided that the success of an all-coin system would depend upon the proper design of a motor-driven coin register with moving inspection table, the box to be in charge of a coin inspector.

Late in 1913 a coin register was installed at Scollay Square station to ascertain the features that would be necessary to insure success on a large scale. The motor and money-counting mechanisms gave little trouble, but it was found desirable to develop a motor which would operate directly on railway voltage instead of using lighting voltage or resistance. By the end of 1915 seventy-eight equipments were in use.

The actual operation of the non-ticket system met the most optimistic expectations of the company. The acceleration of traffic may be appreciated from the fact that 80 per cent. to 90 per cent. of the passengers now have their fares ready in order to avoid stopping for change and possibly losing a car. The incentive to have the exact fare in advance is particularly strong among passengers who pass through a prepayment area in going to those surface cars which are run into part of the subway system.

At the Park Street station it was originally necessary to supply the change makers with \$1000 in change, while to-day \$500 each morning is enough. Another indication that passengers are more likely to have exact fare when coin boxes are used is that the rush-hour travel at this station is now handled by two change makers instead of six ticket sellers.

The change-making booths are so placed that they do not interfere with the direct movement of those passengers who have their fare ready. The coin register records pennies, nickels and dimes. Every coin falls through the hopper onto a revolving drum which carries it into a locked receptacle. If the fare inspector sees a suspicious coin he causes the drum to stop until he has satisfied himself that the coin is either good or bad. It is found that the number of non-current coins is astonishingly small. Thus of \$340,000 taken in these boxes during November, 1915, only the equivalent of \$11 was non-current. Even of this insignificant sum more than half was redeemable. Foreign keepsake coins are found oftener than slugs.

The remarkable acceleration of traffic produced by the aid of the motor-driven coin registers is shown by the fact that at Park Street fully 8000 people have been handled in one hour with one box. During the summer a baseball crowd of 9000 has been handled at Kenmore Street station, Fenway Park, in 12 min. with four fare boxes.

One-person Turnstile Stations.—At three Boston stations, (with thirty-six more to follow during 1917), the coin register is built directly into the change maker's booth and behind it is a five-arm turnstile with a table on which passengers can rest packages while paying fare. The window of the change maker is so placed that those who have the exact fare can proceed to the cash hopper and turnstile without standing in line. The passenger cannot go through the turnstile until the cashier releases it, following her inspection of the coin deposited. As the turnstile counts every passenger, it can be used as a check on the coin register.

These registers are similar to those where there are no turnstiles except that the locked drawer is not used, the operator having access to a different form of money drawer in order to have change. Also, like the motor-driven coin registers on Boston cars, a separating device is used to lock up all coins of the size of a penny to prevent beating the machines with filed-down nickels or flattened dimes.

Fare Collection on Foreign Rapid Transit Lines.—Owing largely to the zone system of fare charges, the underground and elevated lines of Berlin, Hamburg, Paris and London employ a method substantially as follows:

The passenger on entering the station announces his destination to the ticket agent. The ticket so purchased states on its face that it is good for travel to a specified station, as at London, or for so and so

many stops beyond the starting stations, as at Berlin. The ticket so purchased is given up on leaving the train to an inspector, who, of course, thereby detects over-riding.

Both at Berlin and Hamburg the experienced passenger may buy his ticket from a machine. At Hamburg it was reported in 1912 that about 10 per cent. of all tickets were sold by means of an electrically operated machine which prints, cuts and ejects the tickets and which rejects slugs or counterfeits. Such machines, which resemble our 1-ct. scales, are used quite a little at steam railroad stations, so that the German public is well acquainted with them.

The bewildering variety of tickets used in London led the Metropolitan District Railway to install a ticket-printing machine at the Victoria underground station. Owing to the complex system of lines the machine must do far more than the German devices. It is under the control of the ticket agent who sells tickets at 1 d., 1½ d., 2 d., 3 d. and 4 d. on which are printed the destination, route, transfer directions, class, fare and date.

Because of the absence of a zone system on American city rapid transit lines the foreign methods of control to prevent over-riding are unnecessary.

Fare Collection at Ferry Lines, Terminals and Parks.—The coin fare box, of course, is available for use at terminals and other places of like character. Thus the Southern Pacific Company adopted them for its San Francisco ferry terminal in 1915 to save passengers the time and annoyance of purchasing tickets.

The Peoples Railway, Wilmington, Del., operates a park at Brandywine Springs. The fare includes admission to the park. Until 1911 the return fare was paid on the cars. Owing to the congestion of traffic at the park exits and the consequent crowding of the cars, many fares were lost. A turnstile and fare-box system was installed to eliminate these losses. Registering turnstiles were placed at the entrance of the park to count the traffic from the cars into the park. No money was collected at this gate, but the registration thus effected served as a check against the fare receipts to the park. Registering turnstiles were also installed in conjunction with an automatic fare box at the park exits where the return fare was collected and registered. These two counterchecks proved very useful. About 5000 people per day were handled by each turnstile.

A successful variation of the front-end collecting system has been used by the Kansas City Railways at Electric Park, the city's chief summer resort in the southeast section of the city. Much difficulty formerly was encountered by the company in collecting from all passengers during the rush hours at the park, as well as in handling the crowds

expeditiously. Automatic turnstiles have been installed at the park exits, two conductors being stationed there. All persons leaving the park desiring to ride into the city pass through the gates, the number being automatically recorded. The men at the gates must show 5 cts. for each person using the stiles. One man collects fares, while the other distributes transfers on which only the hour is punched. Passengers then board any car they wish, entering by either the front or rear doors. As soon as the car is filled it moves on, the conductor collecting or punching the transfers held by the passengers at his leisure, and not as the passengers enter. In the past many persons riding to the park have remained on the cars, the conductors being unable to collect the return fare by reason of inability to identify the passenger. Anyone not holding a transfer received at the park exit must now pay the conductor.

Rules as to Issue and Use of Transfers.—The questions of time limits and number of transfers are necessarily local matters, but two rules concerning transfers should be universal.

First, transfers should be given only on presentation of individual fare or else, under heavy loading conditions, immediately after all fares have been collected. Very few passengers will fail to remember that they want a transfer if the conductor keeps saying "Transfer" continually. This avoids many disputes and eliminates fraudulent request for transfers. In the case of interurban lines with city connections, the passengers receive transfers only on payment of the last zone fare.

Second, that it should be impossible to return to or near the starting point for a single fare. This rule makes it necessary to specify that a transfer to a stated line will be good only for a northbound or southbound car, depending upon the direction of the car from which the transfer was issued. In Brooklyn a green transfer is issued when the register is running for "In" trips and a yellow one is issued when it is running for "Out" trips. In some cities, also, the line layout makes it necessary to specify that a transfer to a stated line will be good only at the nearest intersection, for otherwise a passenger might be able to return in the same general direction.

In a few instances transfers are given to non-intersecting routes one or two blocks away on a parallel street. In Brooklyn the reason lies in the fact that some of the lines have been re-routed from Fulton to Livingston Streets to decrease congestion. A transfer of this character is also justifiable if it enables the passenger to use the most direct way to his destination.

The Use of Transfers.—A great deal of ingenuity has been devoted to the design of transfers which could not be used by passengers except in the way intended by the company. Some companies have even gone to the extreme of using a variety of colors for different hours of the day

and of requiring a large number of punchings. The modern tendency, however, is toward a transfer which simplifies the work of the issuing and receiving conductors while retaining the safeguards against fraudulent use which have been found necessary. One such step in the direction of simplification is in the indication for the day of use. Many companies now print this date on the transfer or, on smaller roads, have it perforated by the carhouse clerk before the packages of transfers are issued to the conductor, thus reducing by one the number of punchings required by the conductor. Another step has been in the attachment to transfers of a p.m. coupon. The transfer is issued with this coupon only after 12 o'clock noon so that the receiving conductor can easily identify a transfer issued during the morning hours from one issued during the afternoon hours.

Transfer-printing Machines.—A way out of the difficulty of quickly issuing transfers is promised by transfer-printing machines which would

MACHINE NO	FROM	TO	DIRECTION	TIME	CONSECUTIVE NUMBER	DATE
	KEDZIE	21 st ST.	NE	10 25 AM	0 2 0 5 2	SEP 11 15
ISSUED BY CONDUCTOR NO 27						
This space may be utilized for displaying any information or limitations that may be desired printed on the transfer.						

FIG. 80.—Transfer from transfer-printing machine.

permit the conductor to maintain time limitations readily because the actual issuing time would be printed on the slip. The conductor's transfer record for the day would be merely an initial transfer and a final transfer issued to himself and turned in with his report. The intervening transfers would be the ones issued in serial order. Fig. 80 shows a sample transfer from one machine.

Types of Transfers.—The Denver transfer adopted in 1912 is arranged so that the conductor cancels the transfer line and punches to the exact minute of reaching the crossing. Under the old system he punched for a time equal to 10, 20 or 30 min. plus that of the intersection itself. This required him to know the headway of forty lines. Passengers are now expected to take the first car available, but reasonable allowance is made for congestion, use of the second car following, walking time to transfer points which may be several blocks away, etc. In fact, for delays of 2 min. or more the conductor may re-issue the transfer, canceling the time to cover the length of the delay.

In the year 1909 the New York State Railways adopted a color scheme to save time for the conductor in picking up transfers accurately during the rush hours. The hour was divided into four 15-min. parts. Thus a white transfer was void 30 min. after the hour punched and a yellow one was void within an hour after being punched. Two perforations indicated the line and direction and the transfer point. This plan was abandoned as too troublesome in favor of the 15-min. type transfer. The new transfer is of a different color for each line.

The common practice with regard to time limit on transfers issued by a city line with interurban transfer points is well expressed by a rule of the Utica & Mohawk Valley Railway (New York State Railways—Utica-Syracuse Lines) more than six years ago, which reads as follows:

"Conductors on cars which are running at one-half hour, or longer intervals, will accept transfers punched to their line on the next connecting car after the time punched, if the passenger has not had the opportunity of getting a car on the time punched."

It is significant that railways in large cities like New York have abolished the fractional hour limit, not deeming it worth the trouble. The perforation on such transfers is made usually between two succeeding hours. Consequently with the use of a dated transfer that gives the names of all valid intersecting lines the conductor can prepare in advance for an entire half-trip. Owing to its complex line layout, the Brooklyn Rapid Transit System shows on its transfers only the lines to which free exchange is not given.

To-day on most transfers, particularly on systems like those in Brooklyn and New York, which are large enough to do their own printing, the date is printed in large red letters across the face of the transfer. This scheme is less troublesome than the use of a different shade for each day of the week, as once tried at Lincoln, Neb., and elsewhere. It may involve a slight waste of stock, but will avoid dispute with dishonest passengers.

Separate transfers are printed for each line where the lines are too numerous to make easily read punch marks for issuing and destination lines.

Double-transfer Tickets.—Three different styles of transfers may be described for cases where a passenger is entitled to a second transfer, or even to a third, to continue his ride in the same general direction.

One plan is to permit the passenger to keep the transfer until he boards his final car. The obvious objection to this is that the conductor of the intervening lines has no tangible record of such traffic, and this in turn invalidates much checking and accounting.

The second plan is to issue one color of transfer for a single change and when the passenger gives this up he receives a second differently

colored transfer which will carry him to the next line. This plan gives the desired check. Occasionally, however, a hard-pressed or careless conductor may issue the second transfer when the name of the issuing line shows that the passenger is trying to return in the same general direction.

The same trouble occurs still oftener where it is customary to issue a two-transfer color when the passenger is entitled only to a one-transfer color.

The third and safest plan is that of the coupon or stub transfer as employed by the Third Avenue Railway and others. The conductor on each successive line tears off one coupon which shows on its face the lines for which it is valid. The conductor on the line of destination collects whatever is left. The coupon transfer, naturally, costs more than the other ways named, but it is the least subject to abuse. Such transfer may also have an "emergency" space as at Louisville.

At the beginning of 1916 the San Diego (Cal.) Electric Railway adopted a new form of transfer, shown in the reproduction in Fig. 81, which has eliminated in a large measure the abuses of stopping over and round-trip and indirect-route riding formerly prevalent on this system. The transfer entitles the passenger to a journey in one continuous direction within the time limit shown, but it is not transferable and does not permit a stop-over. When a second transfer is necessary, a red one is issued. No passengers are allowed a red transfer except for one or two routes to remote parts of the city.

The Pittsburgh Railway transfer adopted in 1914 eliminates the necessity for issuing a transfer on a transfer except in the case of certain short shuttle lines, for which a special form of ticket is issued. Three different tickets are provided. One of these is of the usual form and is used in ordinary city work. Each route is supplied with its own transfers. The date numbers are arranged out of sequence to prevent disputes as to the intention of punch marks. The other two types have one and two detachable coupons, respectively, for re-transfer when the passenger wishes to ride on two or three different lines. It is required, however, that the passenger shall indicate his destination when asking for his transfer so that in general passengers are prevented from retaining any part of the ticket. These transfers are changed every half month, the date numbers being 1-15 on one form and 16-31 on the other.



FIG. 81.—San Diego transfer.

In some cases the limitations printed on the back of the ticket include every possible transfer that can be made from the route, but in general the passenger may not transfer from an inbound route to one which may eventually get him upon an outbound car on one of the major lines paralleling his original route.

By the use of a manually operated V-shaped knife the month and the day of the month are cut out of the entire pad before the transfers go to the conductors, so the latter punch "time" only. The month and date are staggered to facilitate the detection of out-of-date transfers by the conductor.

Special Transfers.—Other types of transfers for which provision must be made are "continuing trip," when passengers from short-line cars change to through cars, and "emergency," when a breakdown of one line makes it desirable to transfer to any other cars whatsoever which run in the general direction. Such transfers may be issued either by the conductor or street inspectors.

As emergencies are rare and usually cannot be anticipated, the emergency transfers should be of different shades to minimize fraud. For instance, an undated blue ticket might be issued on one day and then the conductors or inspectors would turn in the remainder and get undated red tickets for the next emergency. Such transfers will go far toward allaying the exasperation which passengers feel when any long delay occurs on their regular routes.

In Brooklyn the same transfers are issued by the conductors whether for short or through cars. A passenger who wishes to transfer to a line beyond the short car's terminus is instructed to hold his conductor's ticket for use on the line to which he wants to transfer, and to obtain from the transfer agent at the short-car terminus a transfer agent's pink transfer good on the next through car to the transfer point that he wishes to reach.

On the New York Railways, the conductor gives the passenger a three-coupon ticket. If we assume that the passenger has boarded a 116th Street cross-town car, the right-hand coupon of his ticket carries the names of all the longitudinal lines to which he may transfer. When the passenger boards the car of any longitudinal line, the second conductor detaches and keeps the right-hand coupon. The left-hand coupon carries the names of all cross-town lines except the line on which the passenger started. Hence, if this passenger does transfer to a cross-town car the second conductor will detach the left-hand coupon. The "parent" portion is good for another transfer if necessary. A liberal, non-fractional time limit is punched by the conductor who received the cash fare.

Conductors of northbound cars issue green tickets and conductors of southbound avenue cars issue red tickets. Most of the cross-town

(east and west) tickets are white, but on some downtown cross-town lines the conductor issues a buff-colored ticket westbound and a lilac-colored ticket eastbound to prevent round trips under the conditions which exist on these lines.

The New York Railways ticket indicates the day of issue and whether it is for a.m. or p.m. use. The a.m. division of the day is between 5 a.m. and 3 p.m. and the p.m. division between 4 p.m. and 4 a.m., instead of using noon and midnight respectively. This is now done because some people were found to prolong the time limits of their transfers by riding in a car for a short distance in the noon lunch hour with an a.m. transfer in order to get in return for it a p.m. transfer. This abuse is made more inconvenient by extending the a.m. division to 3 p.m. A figure I in the center of the parent coupon also helps the conductor to distinguish the a.m. from the p.m. ticket, the latter bearing a "II." Each coupon also shows the number of the issuing line. The end coupons are distinguishable between a.m. and p.m. by the use of a black square after the distinguishing number of the p.m. coupon. The coupon to be detached first, usually the right-hand, bears a star.

Bodily Transfer.—Although transfer by tickets is most common it is sometimes possible to avoid their use, particularly for continuing trips. Thus at Boston passengers from the surface lines transfer to the elevated


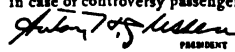
OKLAHOMA RAILWAY COMPANY		Jan	May	Oct
	TERMINAL TRANSFER	003401		
	This Transfer is good on any line except			
FAIR GROUND WHEN PRESENTED TO CONDUCTOR WITHIN TERMINAL STATION ENCLOSURE. Conductors will not honor for passage if presented at any other point, nor will it be honored for admission to the station enclosure. Issued subject to the rules of the Company and on condition that in case of controversy passenger will pay fare and apply at office of Company for redress within five days.		 PRESIDENT		
		NOT TRANSFERABLE		
		Aug	Apr	Nov

FIG. 84.—Transfer used at terminal (Oklahoma City).

or subway lines without ticket, because the cars enter an inclosure to which only car occupants have access. This practice saves much time for the passengers and avoids the expense and inconvenience due to the use of paper.

The principle of bodily transfer applies, of course, to city terminals used by different lines. At Oklahoma City passengers who enter the terminal receive a check on paying fare. The conductor treats this like a cash fare, and transfers to intersecting lines are issued upon it. Passen-

he then claim that he has found his personal funds "short" the average is refunded; if he makes no claim, he gets nothing. On one road which does not register but carefully checks transfers a conductor is fined 5 cts. for every one unaccounted for. In either case, the conductor will suffer demerits. In the stress of the rush hour mistakes are easy and should not always be looked upon in the worst light.

It may be pertinent to suggest that a check on the receiving department would not be out of place occasionally. It is doubtful whether many companies are checking the receivers' returns against the register readings turned in by the conductors.

Checking Transfers.—With the counting of transfers, whether automatically by register or by hand for the trip sheet, the problem becomes complex enough to lead to the most diverse practices and conclusions.

Perhaps the most important thing on lines which register transfers is to prevent conductors from trading in them. Since there is no way of holding the conductors down to a fixed number of transfers, an effective check will depend upon periodical street counts of transfer traffic so that big variations in the return of cash and transfers can be detected and followed up. Trading in transfers can also be restricted if the conductors are required to place them in boxes after every trip, the boxes being emptied every time the car comes to the terminal. The time on the transfer envelope, of course, should correspond with that of the trip sheet or day card.

Further, there does not seem to be any good reason why conductors should be permitted to keep punched and unused portions of undated transfer pads in their possession. On one large New England system where this was permitted each conductor was checked in this wise: He would turn in the opening number on starting by handing the first transfer to the carhouse clerk, while on returning from the last run he would give him the top transfer of what was left. Thus the clerk had the limiting serial numbers of the transfers used during the day by that conductor. The conductor kept the rest of the transfers for use during the next day.

On the Public Service Railway, Newark, N. J., the conductor places the transfers in trip envelopes at the end of each half trip. He notes on his day sheet the number of transfers issued. The unissued transfers are returned by him, and after the closing number has been recorded these transfers are deposited in a locked box at the carhouse for transmissal to the auditor. The issued transfers are checked as to the time of issue and the time of collection and are also compared with the issuing conductor's report, shown on the day sheet. At the commencement of his day's work the conductor receives enough transfers to cover his requirements for the day—the commencing number and the closing number of transfers issued to him having been recorded on the transfer report.

At the completion of his day's work, the commencing number and the closing number of the unissued transfers returned by him are likewise recorded on the transfer report.

On the New York State Railways—Rochester Lines—where double registers are used, the transfers are put into envelopes which show the number contained, the trip and the time. They are kept by the conductor until he turns in his money at the end of the run. A transfer band is placed around the number of envelopes and the number of transfers marked on the band. The receiver simply counts the number of envelopes contained in the band, the transfers themselves being counted at the auditing office.

On the Cleveland Railway, because of an agreement with the city, 1 ct. is charged for each transfer when issued, and in certain circumstances a cent is returned to the passenger when he presents the transfer for use. Any plan by which a charge is made for a transfer makes a splendid regulator of transfer issue and collection if the conductor has the time to make change.

At Little Rock, Ark., it was customary to use a transfer box for checking transfers. This box had a time stamp on it which registered automatically when the conductor put his transfer envelope in the box at the end of every half trip. The envelope could not be withdrawn after it had been stamped.

At Denver transfers are registered and checked to make the conductor appreciate their value. The month and the date are cut out before leaving the office. The conductor before leaving the carhouse receives and receipts for enough transfers to last his car all day. When he is relieved he turns over the rest of his supply to his relief. Each conductor retords on his trip sheet the entire supply received and the number of transfers issued by him while the car was in his charge. All accepted transfers are enclosed in an envelope and deposited each trip in boxes placed at convenient points, from which they are collected several times a day and taken to the auditing department for immediate checking.

Where it is held that transfers have no monetary value because they are not registered, the conductors will have no incentive to exchange or give them away, but they are likely to be careless about issuing or accepting transfers. It is necessary, therefore, to check daily the ratio of transfers issued to fares collected, and to have the conductor keep all mutilated or mispunched transfers in a separate envelope to be handed at the end of the day to the division superintendent. These void transfers plus those returned by the conductor as unissued and his record of issued transfers must agree with the number of transfers originally given to him.

On such a railway transfers issued or destroyed are accounted for as follows:

Transfers as received from the printer are checked with the original order and forwarded to the different divisions. The division superintendents issue the transfers daily, taking a record of the beginning and ending number of each pad issued to each conductor. The conductor's trip sheet is so arranged that he can place the beginning and ending number of the transfers and the number issued each half trip opposite the fares collected, and record space is also provided for any mispunched or mutilated transfers. The back of the trip sheet serves for a memorandum of the number of transfers received, the number issued to passengers and the number returned unissued to the division superintendent. The conductor's turn-in is checked by the division superintendent who sees that the beginning and ending number of the unissued transfers agree with the conductor's report. Then he enters the returns on the daily sheet opposite the transfers issued to that particular conductor. Next the columns are added. Of course, the number of transfers issued to passengers and the mutilated transfers, together with the unissued transfers returned to the car station, must total the original number of transfers given the conductor.

The carhouse records, the trip sheets, the unissued, mispunched transfers and the collected transfers (in envelopes for each trip) are forwarded to the comptroller for a systematic audit. All unissued transfers returned are examined to see that all the transfers are there and that the conductor has not extracted or issued any out of their proper order. In this department an adding machine compiles a statement giving the conductor's number, the number of fares collected and the number of transfers issued on each half trip. A letter is written to the general superintendent if any irregularities or mistakes in addition are found. In this way the company is able to check the conductor from issuing more transfers than fares collected or more transfers in proportion to fares collected than other conductors on that line. The whole system is analyzed in this way about three times a month.

Fare Collection on European City Lines.—In commenting on fare-collection data received from European tramways a committee of the American Electric Railway Association, in 1913, thought they would most likely prove helpful where other than flat-rate fares prevail. Items of interest noted were the very general existence of lap-overs, the restricted use of the free transfer and the use of "double" tickets sold at something less than two fares, which take the place of transfers and the second part of which can be used at any time during the day of purchase. The use of tickets is common to practically all of the electric railways on the other side. The utmost care is taken in their printing, numbering and storage, before transmittal to the conductor. Equal care is displayed in the ticket dealings with the conductors covering serial numbers, re-

turn of unused tickets, etc. The conductor is often provided with a strong-box in which to deposit the tickets, and generally he turns this box back with his unused tickets and receipts securely locked therein, depositing the same in larger safes provided for the purpose when a receiver's system is not in effect. The day or trip card is designated as a waybill. A punch register serves as a check on the sale of tickets. Tickets of different colors are used to designate different zones and these enable the ticket inspectors to check the conductor.

The inspectors are clothed with much authority; for instance, one company stated that when a ticket inspector gets on the car and suspects that all is not right, he can require the conductor to turn over his register punch, cash, tickets and everything else for an immediate check. Many of the operating companies are municipally controlled and in some of the cities passengers who do not pay their proper fares are fined. This law holds not only against the passengers who refuse to pay when asked to do so but is invoked against those whom the conductor may overlook.

In connection with the foregoing some further data may be added based on personal observations made in Europe. At first sight it would seem that the present custom of giving the passenger a receipt which must be displayed to an inspector upon demand should be ideal for securing all of the fares. In practice, however, it is quite as easy for a passenger to avoid paying the proper fare or any fare at all as it is on other non-prepayment cars. Over-riding is the crying evil of cities with zone fares, but even where a straight fare obtains, as in Berlin, it is possible to deceive the forgetful conductor of a crowded car by prominently showing a fare receipt which has been received upon a previous trip. On the other hand, some conductors do not scruple to pick up discarded receipts which they pretend later to tear from their serially numbered pads. In Milan an endeavor is made to limit these practices by the use of different colors for the inbound and outbound cars, but any attempt to go further than this would appear to be impracticable. In Zurich the conductor is expected to tear the fare receipt almost completely in two, but elsewhere the custom is merely to punch the ticket or tear off a small portion. Of course, the possibility always exists that an inspector will board the car to see if the passenger receipts correspond to the date, line, conductor's number, etc., but this no more prevents theft utterly than do register checking and passenger counts in this country. As a matter of fact, one may ride on European cars a score of times without seeing any inspector whatsoever. Therefore, European street railways also have good reasons for seeking improvements in fare collection. Prepayment development abroad, already in use at Gateshead and Leicester, Eng., since 1912, will doubtless follow different lines from our own because of the zone system. Liverpool and Vienna have already gone

halfway in building cars with separate entrance and exit. When the prepayment movement has once gained its proper momentum, we may expect to see repeated in Europe the same wonderful advance in rolling stock design and operation which has characterized the evolution of the prepayment car in Canada and the United States.

SUBURBAN AND INTERURBAN FARES

Fare Collection in 5-ct. Zone Systems.—On some suburban systems with 10- or 15-ct. fares prepayment collection is used for the first fare, after which the conductor goes through the car when the next zone is reached; if the car is crowded or train operation is in practice an assistant conductor or an inspector makes the collection. This is usually satisfactory because most riders enter and leave in the first zone, so that the conductor can readily keep track of the riding outside the 5-ct. city limits.

For such service one may use a city-type register arranged with an indicator to show the number of the zone in which the conductor is collecting the fare. This register, of course, must be re-set at the entrance to each zone. If carried beyond the two- or three-zone stage, the repeated fare collections become a nuisance to the passenger and a burden to the conductor.

In the absence of a class register, this practice could be avoided by giving a fare receipt to each passenger according to the fare paid or giving him a hat check if he paid with a ticket. Either kind of receipt could be taken up as the passenger left the car. However, this would give the conductor too much opportunity for fraud both in the punching of cash receipts and in failing to cancel the tickets presented as fare.

Another way is to use a class register, as on regular interurban lines, and give the passenger a hat check, either a different color of check according to the zone of departure (as was done by the Northampton Traction Company, Easton, Pa.), or a check bearing rate of fare and destination. The colored-check scheme is satisfactory for lines with but few zones. The conductor can change his color code as often as he likes thus leaving in the dark any passenger who because his check was not taken up in a previous trip thinks he can ride for nothing next time.

Registers should be classified sufficiently to show ticket fares as such, provided they are sold at reduced rates. Otherwise the conductor is tempted to substitute a ticket for a cash fare, recording the fare as cash, if he feels that the passenger is indifferent.

The conductor should be obliged to turn in all tickets and other tokens of lower rate fares at the end of every half trip to minimize all substitutions of the character cited. Receipts to passengers which show the date of sale and fare for stated trip should also be collected from passengers as they leave and be turned in every half trip for checking pur-

poses. This subject is discussed later in this chapter under the paragraph headed, "Duplex Ticket System and Cash Receipt Holder."

Interurban Prepayment.—An interesting application of the zone system in connection with prepayment was inaugurated Oct. 19, 1914, by the Stark Electric Railroad on its 32-mile line between Canton and Salem, Ohio. In all respects but one the cars used are of interurban type. The exceptional feature is the replacement of the standard vestibule side doors by quadruple doors hinged to the sides and opening in the middle, and by wide fixed steps which give direct access to the conductor's position in the body of the car. When the car is under way the steps are completely



FIG. 86.—Interurban car with end entrance, Stark Electric Railroad, Canton, Ohio.

inclosed. At wayside stops the ground between the rails was filled in and planked to afford passengers a safe and dry footing. An illustration appears in Fig. 86. Two cars of this kind were built.

When passengers board the car they must deposit in a fare box, a fare of some class—namely, ticket, cash or mileage. As the fare is deposited the conductor issues an exchange ticket showing in large type the number of the fare zone into which the passenger is entitled to ride. This exchange ticket must be deposited in the fare box as the passenger leaves the car at his destination. The objection has been raised that the passenger might lose his slip or refuse to place it in the box. This, we think is rather far-fetched in view of the success of zone-leave tickets under the severe congestion conditions that obtain in London bus traffic.

If a passenger should attempt to ride into a different fare zone than the one to which the fare was paid the conductor would then collect an

additional fare. The road has been divided into fourteen fare zones, and each of the large corresponding numbers are plainly seen so the conductor can detect anyone who is trying to over-ride. Small numbers on the edges of the exchange ticket are punched out only when the passenger pays a cash fare. The actual fare paid is five times the difference between the small number punched out and the big number on the ticket, 70 cts. (14×5) being the largest cash fare collected.

The company uses a small box made like a ticket case with tubes holding 100 each of the fourteen fare-zone tickets. This case rests upon an upright piece of pipe and is taken off by the conductor at the end of the run. Each conductor is held responsible for maintaining at all times his supply of exchange tickets.

The cash box is sent to the auditing department each morning for the checking of the contents. Each fare collected must have an exchange ticket to balance it, and the cash in the box must check against the amounts indicated by the punches made in the exchange ticket by the conductors. This may seem a rather long method of checking the conductor, but it has been found to save time when compared with all the steps necessary under the old system of checking cash fare receipts issued and tickets collected. In addition, when the daily report is put on the auditor's desk for the day's business, he knows that all work in regard to checking conductors' reports in his department has been completed and that nothing has been carried forward to do the next day.

The use of prepayment really is not the most important feature here as an interurban conductor is not very likely to overlook any fares, and the fact that he must give the passenger a receipt acts as a check upon him. The best feature from the standpoint of interurban conditions is that the departing passenger must drop his ticket in a box as he leaves the car. In this way, over-riding is most effectually checked. As is the case with other prepayment cars the conductor is also in the best position to prevent accidents.

The New York, Westchester & Boston Railway, operating out of New York since 1912 is also divided into 5-ct. zones, with ticket agents at all stations as on city rapid transit lines. Tickets are sold at all stations and registered by turnstile but are not taken up or even inspected by the conductors as this would be impracticable on a line where the longest run between local stations is made in less than 4 min. To prevent over-riding, the ticket, which shows by color and title the destination zone paid for, must be given up at the exit station. If bought within a lap-over section, half the ticket shows the color of one zone and half shows the color of the next zone in the desired direction of travel. Commutation tickets are punched at the station of entry and viséd by the ticket chopper at the station of departure.

Combined Prepayment and Postpayment for Overlapping Fare Zones.—On the Northern Ohio Traction & Light Company the overlapping of fare zones between Akron and Cuyahoga Falls makes necessary a combination of pay-enter and pay-leave fare collection.

The dividing point between the two fare zones is a place known as the Gorge, but a passenger boarding a car at certain points in one zone is permitted to ride past the Gorge and to the Falls for but one fare. The same practice applies for rides in the opposite direction. The extra distance and ride permitted before the second fare is charged naturally means that there is some traffic entirely within the overlapping district. It is this which makes necessary the plan adopted for pay-enter car operation between Akron and the Falls, in effect since March, 1915.

As the car leaves Akron passengers pay one fare into the fare box upon entering at the rear platform. Passengers for points south of the Gorge make no further payment, but leave the car by the front exit. Passengers getting off at points north of the Gorge leave the car by the rear door and pay the second fare as they pass out. Passengers getting on northbound cars at Chalker's Landing or at points between Chalker's and the Gorge pay one fare upon entering car, and at the time of doing so state their destination. If they intend going north of the Gorge, the conductor issues to each a car-leave check, which is accepted in lieu of the second fare as passengers leave the car. If such passengers are not going beyond the Gorge, the pay-leave check is not needed, for there is no pay-leave fare on northbound cars until the Gorge is passed. On northbound cars, north of the Gorge, passengers enter the car by the front door only and pay fare upon leaving, which in each case is by the rear door only.

Class Fare Registration for Suburban and Interurban Railways.—A considerable number of the interurban railways of the United States and many suburban and city roads as well, employ multi-fare registers on a rental basis. There seems to be no limit to the variety of classifications, one type registering any cash or ticket fare from 1 ct. to \$9.99.

In detail the functions of the register may be stated as follows:

It makes separate registration for each fare collected, the different kinds of cash fares, transfers, tickets and mileage counted as tickets being registered separately and totalized separately.

It keeps a separate printed record of the collection of each conductor. At the completion of each conductor's run all printing counters are turned back to zero except the total passenger and total cash counters. This gives a check between the records of successive men, and between the closing figures of one day and the opening figures of the next.

It shows a separate indicator for each kind of fare registered. The fares registered are simultaneously indicated at various places about the

car, on the platform, on the inside of the partitions, in special compartments of the interurban cars, etc. This indicator can be moved only at the time of registration of the fare so that a conductor cannot register one class of fare and indicate another.

It indicates the direction in which the car is moving.

It prints the number of fares in each class for each half trip.

It prints the trip number.

It prints the month and day.

It prints the number of the register.

It prints the number of each conductor (and the motorman if desired), and shows the platform time he takes and leaves the car. It also prints the inspector's identification by number.

TIME	DIRECTION	TRAIN NO.	PASS	TRANSFER	TICKET	TOTAL CASH	REGISTER NO.	TOTAL PASSENGER	DATE	IDENTIFICATION
3 30P	W.	53	000	000	000	\$9635	4 4	0283	JUL 18	INS5
3 30P	W.	53	011	011	090	\$9635	4 4	0283	JUL 18	278
2 00P	E.	53	005	006	038	\$9589	7 6	0215	JUL 18	278
12 30P	W.	53	000	000	000	\$9552	9 6	0159	JUL 18	278
12 30P	W.	53	016	022	067	\$9552	9 6	0159	JUL 18	237
11 00A	E.	53	012	010	030	\$9518	5 6	0100	JUL 18	237
9 30A	W.	53	000	000	000	\$9488	1 6	0040	JUL 18	237
9 30A	W.	53	000	000	000	\$9488	1 6	0040	JUL 18	INS5
						64	8 0	119		

FIG. 87.—Typical printed register record for two conductors.

It fixes the work and responsibility of each conductor and removes all occasion for disputes. From the register record it shows the various fares in detail which are collected upon interurban cars running over city lines.

It prints a duplicate or triplicate record, showing a summary of the day's business for each car, irrespective of the number of conductors who operate it. The duplicate or triplicate copies may go direct to the treasurer and auditor of the company.

With all this, it is so ingeniously contrived that it is always locked when not in service, and cannot be put into service until the conductor's badge number is first printed upon the statement enclosed in the register. It does the work of an adding machine, a printing press, a time-clock and a cash register.

The operating mechanism includes two rods running parallel with the car—one for selecting or setting, and the other for registering the fare—and one vertical rod which is square and bears a grip fitted on the rod with a square bearing.

The fare is selected by turning the grip until the pointer on the dial indicates the fare collected. Only a downward pull of the grip is then necessary to make the registration.

A typical record (Fig. 87) may be analyzed as follows: Reading from left to right the last print made by conductor 237 at 12.30 p.m. (the fourth line from the bottom) it appears that he registered sixteen passes, twenty-two transfers and sixty-seven tickets and cash or cash values amounting to \$64.80, the latter being found by deducting the first from the last print in the total cash column. The deduction in the total passenger column shows that there were carried a total of 119 passengers. By deducting the total number of paper collections from the total passengers the number of cash-paying passengers is ascertained, which in this case is fourteen.

In the operation of this register no ticket can be registered unless a cash value is also registered and indicated, the cash indication appearing adjacent to the word "ticket." For example, if a ticket valued at \$1.61 is registered the indicator reads "Ticket \$1.61." If the amount collected is actual cash the indicator reads "Cash \$1.61" and the register is locked against operation if the indicator is made to read "ticket" or "cash" with no cash amount following. Where "Pass" or "Transfer" are registered and no cash value is assigned the indicator simply shows "Pass" or "Transfer" and the space for the cash indication remains blank. All indications appear in the face of the register and are duplicated in various parts of the car by the auxiliary indicators.

Indicating Feature of Class Registers.—The passenger indicator is an important feature in determining whether each passenger's fare has been registered. It is a strong moral force which compels the conductor to register, as its number of registrations must tally with the number of passengers carried on each trip.

If the passenger indicator stands at twenty-five, and three passengers board the car, and three uniform payments of a given sum are made, and the conductor should register for only two, then the passenger indicator would show but twenty-seven instead of twenty-eight passengers.

It may be argued that the conductor could register only two instead of the three fares collected, but not being certain as to whether one or all of the passengers will observe the passenger indicator, and for fear of detection, he is far more likely to register for all three of the fares.

Efficiency Records of Class Registers.—A number of the systems which use the class register described have been inspired by the maker to publish comparisons of conductors on the basis of their accuracy in registration as shown by their returns and the readings of the register. In a number of cases prizes are given for the most accurate records each month.

Of course, the classified register record is hidden from the conductor. If he were to be allowed to settle by his register record he would be encouraged not to register his fares, as he turns in fares equal only to the number the register calls for, which represents only what has been registered and not what has been collected.

With the record locked within the register, the conductor has no means of knowing what his record calls for, consequently he must turn in all his collections. He counts his change before starting to work, deducts the amount when he quits, and turns in what remains.

Cord Type Class Register.—In another form of computing fare recorder, the two rods for setting and registering may be replaced by a rod for setting and a cord for registering. Fare indicators located in various parts of the car are also provided. These are of two types: a double-dial indicator on each bulkhead with pointers to indicate the operation and cylindrical indicators between bulkheads with openings on both sides through which the fare indications can be seen.

When a fare is registered the "Fare Paid" sign appears above the indicator, and when the position of the indicator is changed to indicate a fare different from that last registered the "Fare Paid" sign disappears and the "Not Registered" sign is exposed. The latter remains above the fare indicator until a fare is registered, when the "Not Registered" sign disappears and the "Fare Paid" sign is again brought into the indicating position. This method of distinguishing the fares actually registered from those only indicated and keeping the indicators distributed throughout the car in unison with the indicator on the recorder overcomes the serious objection to having the indicator covered up during the registering operation. When the indicator is so covered it is impossible to check registration when the fares are "bunched" or rung up in rapid succession.

The records are a complete computation of the fare receipts, showing in detail the number of each kind and denomination of fare collected on each trip, as well as the number of passengers carried and the starting and leaving time; also the total registrations of each kind of fare during the entire run regardless of the number of trips made. The records are in the form of a balance sheet. The items of registration can be verified by both cross and column addition. In Figs. 88 and 89 two forms of records are shown, each covering the same number of trips and hours of operation.

To produce the record shown in Fig. 88 the conductor sets the counters at zero at the end of each trip, the record showing the number of fares of each denomination collected on the trip, and the total number of fares for all the trips.

To produce the record shown in Fig. 89 the conductor does not set

the counters at zero until the end of his last trip. The last reading from the register which he takes shows the total number of all fares registered. The relief conductor who takes charge of the car then takes a zero reading to show the condition of the register at the beginning of his run as indi-

RECORDER NO. 2856		INTERURBAN TRACTION COMPANY												DATE	
		TOTAL RECORD													
		PASS	TICKET	TRANSFER	5c.	10c.	15c.	20c.	25c.	30c.	35c.	40c.	45c.	TOTAL PASSENGERS	REGISTER TOTAL
		12	92	36	46	69	50	39	40	20	24	15	22	465	15648
TIME		TRIP RECORD												CAR NO. 1449	
3.30 PM	02	15	05	06	11	05	6	2	1	4	2	1	60	C-1228	
2.15 PM	01	09	04	03	09	06	5	4	3	4	2	2	52	C-1228	
1.00 PM	02	11	06	05	11	10	4	6	3	1	2	1	62	C-1228	
11.45 AM	01	08	05	10	09	04	2	4	2	3	2	5	55	C-1228	
10.30 AM	00	14	04	03	08	07	5	7	4	2	1	3	58	C-1228	
9.15 AM	01	11	03	05	04	09	6	8	3	4	3	5	62	C-1228	
8.00 AM	03	14	04	08	12	05	5	6	3	4	2	2	68	C-1228	
6.45 AM	02	10	05	06	05	04	6	3	1	2	1	3	48	C-1228	
5.30 AM	00	00	00	00	00	00	0	0	0	0	0	0	00	C-1228	

FIG. 88.—Computing fare recorder. Record obtained by single conductor.

cated at 3.30 p.m. on the sample record. This conductor then operates the recorder the same as the preceding conductor, the last register reading showing the total result of the registrations for his period of work.

When operation of the car is discontinued for the day, say 11 p.m.,

RECORDER NO. 2856		INTERURBAN TRACTION COMPANY												DATE	
		TOTAL RECORD													
		PASS	TICKET	TRANSFER	5c.	10c.	15c.	20c.	25c.	30c.	35c.	40c.	45c.	TOTAL PASSENGERS	REGISTER TOTAL
		31	157	62	85	96	59	47	53	34	29	25	30	708	17442
TIME		TRIP RECORD												CAR NO. 1446	
11.00 PM	12	71	28	38	45	21	21	25	14	12	11	14	312	C-2550	
9.45 PM	09	62	24	33	39	18	17	22	12	11	10	12	269	C-2550	
8.30 PM	09	48	21	26	34	15	15	17	10	9	7	11	222	C-2550	
7.15 PM	08	38	16	19	28	12	11	15	8	6	5	7	173	C-2550	
6.00 PM	06	27	11	15	17	08	8	9	4	4	4	4	117	C-2550	
4.45 PM	02	12	04	03	07	05	3	6	3	1	2	3	51	C-2550	
3.30 PM	00	00	00	00	00	00	0	0	0	0	0	0	00	C-2550	
3.30 PM	19	86	34	47	51	38	26	28	20	17	14	16	396	C-1228	
2.15 PM	17	76	31	41	46	31	22	26	15	16	12	15	348	C-1228	
1.00 PM	16	67	25	33	42	26	14	24	12	15	11	13	298	C-1228	
11.45 AM	12	58	19	26	34	20	11	20	11	14	9	11	245	C-1228	
10.30 AM	09	46	17	21	28	16	9	15	8	11	6	10	196	C-1228	
9.15 AM	08	36	14	16	22	13	6	11	6	7	4	9	152	C-1228	
8.00 AM	07	25	07	14	15	07	4	10	4	5	3	5	106	C-1228	
6.45 AM	05	10	04	07	05	02	1	4	2	1	2	2	45	C-1228	
5.30 AM	00	00	00	00	00	00	0	0	0	0	0	0	00	C-1228	

FIG. 89.—Computing fare recorder. Record obtained when conductors change.

an authorized employee takes a final reading from the recorder, obtaining a record of the total fare registration made by both conductors. The work of any number of conductors operating on the same car can, of course, be covered in this way.

With either of the above forms of record, it is optional with the company whether the conductors are permitted to remove the records from the recorders and use them in making settlement or else to have the records removed by an inspector or register clerk and later check them against the returns made by the conductor.

Traffic Recorders.—A recent type of recorder is one that includes an account of traffic. This machine produces a printed slip upon which is recorded the boarding and alighting points of each passenger on the car, and in addition totals the number of cash or ticket fares and the passenger mileage made upon each trip. As a result traffic statistics of a most elaborate character are available at all times for every run, and the necessity for guesswork or expensive traffic counts to adjust the service to the requirements of the traffic is eliminated.

At the same time the recorder affords economy in auditing and gives a basis for checking reports of special-service men. It classifies each fare and enables the auditor to determine accurately the earnings of every train and the earnings per passenger-mile. To the operating department it supplies a tabulated statement of traffic between stations by trains and does away with the necessity for counting passengers at terminal points and ringing them all up at once upon a city register. The recorder is adapted of course only to interurban service. A typical record slip and the tabulated results for a single trip are shown in Fig. 90.

The machine is rapidly operated. As an example, on the Anderson-Wabash division of the Union Traction Company of Indiana the trains leave Marion in the rush hour with an average of 100 passengers, to a number of outlying towns. These variable fares, however, are always collected and recorded before the train arrives at the first outward-bound stop, which is reached within 10 or 12 min.

The operation of the recorder is based upon the mileage traveled by the person paying fare. Instead of setting the register in terms of money, the machine is set in terms of stations or fare points, and the act of setting the pointers to any two given stations automatically computes both the distance traveled by the passenger and the amount of the fare.

The recorder proper is located at the rear end of the car, and two dial cases, one at the front end of each car compartment, carry the dials on which are printed the names of the stations on the division over which the car is operating. Four dials are provided within each case, with stations of a division marked on each side, so that a different dial is available for any one of eight different divisions if necessary. Each dial is divided into half-mile subdivisions covering 100 miles of run. The dials carry three pointers, one indicating the starting point and another the destination. The third is provided for arbitrary fares, being moved backward

Duplex Ticket System and Cash Receipt Holder.—Quite a number of multi-fare lines use a duplex ticket system, similar to that employed by steam railroads. On both classes of railroads the receipts are issued to those passengers who have not provided themselves with transportation before boarding the train. Owing to the large number of wayside stops and small stations, ticket selling on the train is a bigger part of the business than on steam railroads. It can be minimized, however, by

City Ter. — Rochester	Rochester — City Ter.
City Line — Rochester	Rochester — City Line
Glen Haven Jct.	Glen Haven Jct.
Otis Stop	Otis Stop
Power House Stop	Power House Stop
DATTON'S COR'S	DATTON'S COR'S
Glen Edith	Glen Edith
WEST WEBSTER	WEST WEBSTER
5 Mile Line	5 Mile Line
Hard Road Crag	Hard Road Crag
Siding No. 10	Siding No. 10
WEBSTER	WEBSTER
Newham's Stop	Newham's Stop
Lawrence's Stop	Lawrence's Stop
UNION HILL	UNION HILL
Ritz's Stop	Ritz's Stop
FRUITLAND	FRUITLAND
Blythe's Stop	Blythe's Stop
ONTARIO CENTER	ONTARIO CENTER
ONTARIO	ONTARIO
Maple Road Stop	Maple Road Stop
Pease Road Crag	Pease Road Crag
Ridge Chapel Stop	Ridge Chapel Stop
Fish's Stop	Fish's Stop
WILLIAMSON	WILLIAMSON
Milham's Stop	Milham's Stop
E. WILLIAMSON	E. WILLIAMSON
Bell's Siding	Bell's Siding
Moody's Stop	Moody's Stop
SODUS	SODUS
Pullman's Siding	Pullman's Siding
Barclay's Stop	Barclay's Stop
WALLINGTON	WALLINGTON
Glover's Stop	Glover's Stop
Morley's Stop	Morley's Stop
Seamon's Stop	Seamon's Stop
SODUS POINT	SODUS POINT
HALF FARE	HALF FARE
EXPRESS	EXPRESS

NEW YORK STATE RAILWAYS—Rochester & Sudus Bay Line
TRAIN TICKET
 Date **JAN 1909**
 Good for the continuous trip between points notched for this day and train only. Retain this receipt as evidence of fare paid.
 PASSENGER
 TICKET AND RECEIPT NOT TO BE CANCELLED
 GEN. PASS. AGT.

FIG. 91.—Duplex fare receipt. The part at right is given to passenger; that at left is retained in conductor's holder.

paying a small commission to local stores for acting as ticket agencies and for displaying timetables and posters.

Under the ordinary duplex system of fare receipts for cash fares, the conductor punches the initial station and destination with the month, day, etc. One portion of this duplex receipt is given to the passenger and the other portion is returned to the auditing department. The time required to indicate these data is considerable, and the plan has not been found satisfactory in other ways, notably because the passenger's portion can be indicated separately from that of the audit stub. Furthermore, the passenger takes little interest in checking the fare indicated.

A quick method of issuing train fares in which these difficulties are avoided is embodied in a device put on the market in 1915. This is an aluminum holder made to contain a pad of 100 receipts, assembled in flat form, as distinguished from the beveled type previously used, and equipped with a register-locking device which records each time the holder is opened. The method of cutting the ticket from the stub eliminates the possibility of different amounts being indicated upon the ticket and on the audit stub. It has also been found that conductors can issue these tickets in one-third or one-half the time required with the old form of duplex ticket.

In practice, one or two holders are given to each conductor with the register-locking device open and the reading of the register is recorded upon the cardboard back of the pad. This enables the conductor to insert a pad of tickets at any time without increasing the register reading and eliminates the necessity of loading and unloading of holders at one central office. The holder is provided with a pair of index cutters, and before each receipt is issued the conductor sets the cutter opposite the station required and tears off the receipt which is given to the passenger. The other half of this receipt is thrown into the holder by the conductor by pressing both sides of the holder together. The stub thus remains inside the holder, secure from any form of manipulation, until it is removed by the auditing department. In the illustration, Fig. 91, the stub is at the left and the ticket is at the right.

Zone Fare Receipts.—With the introduction of the copper fare zone plan on Jan. 1, 1915, as described in the chapter on "Fares," a system of cash fare receipts was inaugurated by the Union Traction Company of Indiana to take the place of the recording fare register, and the fare registers were removed from the cars. The fare receipts are in duplicate, passenger's fare receipt and auditor's stub, numbered consecutively and bound in pads. At the end of each run the conductor turns in the duplicate receipts in an envelope, and each day the stubs in the conductor's book and the cash fares for the day are audited.

The management believes that the new system of fare receipts is most satisfactory in obtaining an accurate accounting of all fares collected on the cars. Since the copper zone system went into effect an increase has been shown in the number of passengers who purchase tickets before boarding the cars. In fact, it was estimated in February, 1915, that more than 85 per cent. of the passengers were purchasing tickets at the stations.

The zone fare ticket of the Shore Line Electric Railway, as shown in Fig. 92, has numbers opposite the names of the stations, beginning with New Haven at 0. These represent the exact amount of fare from New Haven. Guilford is station No. 28, and consequently the fare from New Haven to Guilford is 28 cts. Chester is station No. 86, and the fare from

New Haven to Chester is 86 cts.; the fare between any two stations is arrived at by subtracting the number opposite one station from the number opposite the other. A conductor who is not quick at figures may place the 0 of one ticket against the station from which he takes on a passenger and the exact fare may then be read to any other point on the line. For

Nº 1439

Good for one continuous passage between points punched for this date and train only.
PATENT APPLIED FOR

PUPIL

Nº 1439

Good for one continuous passage between points punched for this date and train only.
PATENT APPLIED FOR

PUPIL

DUPLICATE		THE SHORE LINE ELECTRIC RY. CO. — SAYBROOK DIVISION	ORIGINAL		THE SHORE LINE ELECTRIC RY. CO. — SAYBROOK DIVISION	DATE	
DATE							
Jan	New Haven R. R. St. 0		0	New Haven R. R. St.		Jan.	
Feb.	State and Ferry St. 2		2	State & Ferry St.		Feb.	
Mar.	Quinnipiac Ave. 1 4		4	Quinnipiac Ave.		Mar.	
Apr.	Foxon Flag Pole 8		8	Foxon Flag Pole		Apr.	
May	River Street 10		10	River Street		May	
June	Totoket 2 12		12	Totoket		June	
July	Hopson's 14		14	Hopsins		July	
Aug.	108 No. Branford 16		16	No. Branford 408		Aug.	
Sept.	388 18		18	388		Sept.	
Oct.	368 West Pond Road 20		20	West Pond Road 368		Oct.	
Nov.	348 22		22	348		Nov.	
Dec.	328 24		24	328		Dec.	
1-16	308 Long Hill 26		26	Long Hill 308		1-16	
2-17	Guilford Green 28		28	Guilford Green		2-17	
3-18	308 East Creek 30		30	East Creek 308		3-18	
4-19	328 Station 27 32		32	Station 27 328		4-19	
5-20	348 East River P. O. 34		34	East River P. O. 348		5-20	
6-21	368 Madison Cem. 36		36	Madison Cem. 368		6-21	
7-22	388 Madison P. O. 38		38	Madison P. O. 388		7-22	
8-23	408 Webster Point 40		40	Webster Point 408		8-23	
9-24	Dudleys 42		42	Dudleys		9-24	
10-25	Clinton P. O. 44		44	Clinton P. O.		10-25	
11-26	Dibbell's Corner 46		46	Dibbell's Corner		11-26	
12-27	Grove Beach Casino 48		48	Grove Beach Casino		12-27	
13-28	Hammock 50		50	Hammock		13-28	
14-29	76A Chapman Sch. 52		52	Chapman Sch. 76A		14-29	
15-30	74A Stannard Beach 54		54	Stannard Beach 74A		15-30	
31	72A Chalker Beach 56		56	Chalker Beach 72A		31	
	70A Oyster River 58		58	Oyster River 70A			
	68A Saybrook P. O. 60		60	Saybrook P. O. 68A			
	66A Car Barn 62		62	Car Barn 66A			
	64 Ferry Road 64		64	Ferry Road 64			
	62A Ayers Point 66		66	Ayers Point 62A			
	60A Gladdings 68		68	Gladdings 60A			
	70A Essex Square 70		70	Essex Square 70A			
	72A Essex Station 72		72	Essex Station 72A			
	74A Behrens & Bush 74		74	Behrens & Bush. 74A			
	76A Ivorvton Junc. 76		76	Ivorvton Junc. 76A			
	78 Stroms Crossing 78		78	Stroms Crossing			
	80 Middlesex 80		80	Middlesex			
	82 Deep River Hotel 82		82	Deep River Hotel			
	84 Ryans Corner 84		84	Ryan's Corner			
	86 Chester 86		86	Chester			

FIG. 92.—Zone fare receipt, Shore Line Electric Railway.

instance, place New Haven, 0, against Guilford Green, 28, and opposite Ferry Road, station 64, appears the number 36. The fare then from Guilford Green to Ferry Road is 36 cts. This figure may also be arrived at by the means described on the ticket, namely, to subtract 28 from 64. The result is the same, 36 cents.

The large figures from 1 to 9 that appear on the ticket have really no special relation to the system except that when a conductor arrives at

station 22, going out from New Haven, the large figure 3 calls his attention to the fact that he should collect his Guilford Green checks between stations 22 and 24. Going west, that is from Chester to New Haven, the figure 4 warns him that he should collect his Guilford Green checks between stations 32 and 30. As a large number of people travel back and forth between the Saybrook carhouse, station 62, where steam road connection is made, and Ferry Road, the company's own junction, the figure 7 is placed between these two stations (62 and 64) as the conductor collects there in both directions.

The company also provides a little clip to attach to the seat or pilaster of the car into which the destination check can be readily placed when folded, and these large figures seen through an opening in the clip. In other words, a conductor going out from New Haven would fold his Guilford Green checks so that the figure 3 would show through the clip, and, coming in from Chester, he would fold his Guilford Green checks so that the figure 4 would show through the opening in the clip. Whether this feature will be of great value depends upon experience, but it is believed that conductors will make considerable use of it.

There are no overlapping zones, and the zones are somewhat in excess of 1 mile each, depending upon the location of little settlements or groups of houses, as terminals of the zones have been worked out to accommodate the largest number of people and have taken into consideration the direction in which these people most frequently travel. There is a minimum charge of 5 cts., which covers a ride in any part of two zones. A rider passing into the third zone is charged 6 cts.; the fourth zone 8 cts., an additional charge of 2 cts. being made for each zone.

Use as Transfer.—The use of this ticket as a transfer is also novel. The branch line stations are numbered and lettered, although the names do not appear on the ticket. Guilford is the first junction out from New Haven, and it will be noticed in the lines each side of 28, first toward Chester, 30B opposite 30, 32B opposite 32 and so on up to 40B. The station that is indicated by 40B is the end of this branch line, and this is a station that is called Stony Creek. The fare from New Haven to Stony Creek is 40 cts. That is to say, this station 40B appears in the line against 40, and the difference between punched holes governs the rate. A passenger bound from New Haven to Stony Creek would receive an original destination check, or cash receipt, punched opposite 0 and on the other side of the ticket in the line 40.

If the passenger were going from Chester, or any point between Chester and Guilford, to Stony Creek, he would receive a ticket punched against the station from which he departed, and the 40B that will be found in line 16 would be punched. The number 16 subtracted from the number of the station at which he takes the car gives the rate that he must

pay. When used as a transfer the date and hour are punched in order to cover a continuous ride.

Other Uses.—The details of the application of this ticket to the transportation of employees, trackmen and so forth are of interest. All of the company's officers and employees (except trackmen) carry passes, and the conductor punches the two stations between which the employee is traveling, the holder of the pass writing at the top of the ticket his name and number of the pass. This avoids the use of employees' tickets, of which the company had formerly used a very large number. In the case of trackmen, the conductor punches as before and fills out the number of the men, on the back of the ticket, and the foreman of the gang signs on the front. If no foreman accompanies the gang and they are not able to write (as is sometimes the case), the conductor, himself, signs on the front so that, in sorting these slips, those used for non-revenue passengers can be instantly thrown to one side.

School tickets are sold in \$3 books, with each ticket representing 1 ct. These are collected at the rate of one for each zone, with a minimum charge of 3 cts. That is, it costs a pupil 3 cts. to ride in any part of one or two zones, and the same in three zones, 4 cts. in four zones, 5 cts. in five zones and so on. In other words, half rate is charged except in the case of a minimum ride, when the charge is 3 cts. from a pupil and 5 cts. from an adult. These tickets must be purchased through the use of an application blank fully identifying the pupil. The destination check, when used in recognition of a school ticket, is punched in the block "Pupil."

The conductor's daily report is simple. All minimum fares are rung up on the register and the register is not turned back until the end of the trip. The reading of the register each time it is changed is extended in his report, in the zone in which the change takes place, and is thrown back to zero at the end of the trip. Against each trip he sets down the opening and closing number of his destination checks and the other information that is necessary to complete the office records.

It is of interest to note that at one time the company planned to change the rates on the two divisions in question by increasing the zone fares to 6 cts. and leaving the zones just as they were, of unequal length and overlapping, in the way common to street railways. However, after serious consideration, it was felt that an increase to 6 cts. simply emphasized the faults of the existing fixed unit of fare and varying units of service, and the company, adopted the present plan as being much fairer, both to the public and to the company. It had the great advantage over an increase to 6 cts. in that it effected a saving to at least a portion of the company's patrons who naturally helped the change to go through without serious opposition, while a flat increase to 6 cts. for the old zones would have met with no support from any quarter.

Use in City Service.—By March, 1916, this system was in use on 240 miles of track, including the Norwich City service. The application to city lines is carried out as follows: Three branch lines are treated as single zones and two branches as double zones. This retains the nickel as the unit of fare from the civic center to the outlying villages immediately adjacent to Norwich, allows a transfer to and from any point within the city limits, and exacts a payment equivalent to 1 or 3 cents for a transfer where the ride is extended into three or four zones.

Interline Fare Collection.—To solve the fare registration perplexities of interline operation, the American Electric Railway Transportation & Traffic Association recommended in 1912 that where interurban roads enter a city over a foreign company's tracks and are required to report the number of city passengers carried, interurban tickets should have a city coupon which will be collected within the city limits as a second collection, in the same manner as city fares are collected. The association committee believed that this recommendation provided the simplest method of segregating interurban and city fares. It did not believe that passengers would consider such a practice burdensome, inasmuch as they would not be called upon to pay fare a second time but simply to retain a coupon which would be collected as the car passed into city limits. Otherwise, if records of city fares are to be made and shown upon a register, the conductor would either have to collect the city fares as the car entered the city and ring up as collected, or he would collect them at the same time as he collected the through interurban fares. The first plan would be an inconvenience to passengers; the second plan would make the checking of the city fares by the city company difficult. The use of a city coupon would also furnish the often-important data as to the amount of through riding to the city compared with city pickups. This coupon idea has actually been used by the Pennsylvania and the Hudson & Manhattan Railroad in determining how many Pennsylvania passengers used the Hudson & Manhattan's connection at Manhattan Transfer to go to New York.

So far as the writers know, the committee's suggestion for making this distinction between interline fares has not been put into practice by interurban railways. When the proposal was discussed at the 1912 convention it was urged that, as a rule, Eastern interurbans could not adopt the plan because upon the arrival of a foreign car at a terminal at the city limits, it became practically the property of the city company. It was under the control of the city company's crew and the conductor was authorized to accept nothing but cash fares. The city railway did not believe in hat checks, receipts or anything else of the kind that would confuse interurban with city business. It segregated city business entirely.

One solution of the interline problem is noted in the case of through cars operated between Detroit, Mich., and Cleveland, Ohio, over the tracks of five different companies, namely, the Detroit United Railway, Detroit, Monroe & Toledo Short Line, Toledo Railway & Light Company, Lake Shore Electric Railway and the Cleveland Railways. A separate account must be kept of the fares collected on each line and, in so

SAN ANTONIO CONDUCTOR'S		TRACTION CO. TRIP REPORT												
LINE _____		DATE _____												
191 _____														
CAR NUMBER	RUN NO. TRANSFER READING	STATEMENT OF REGISTER TAKING AND LEAVING CAR	CAR REACHING BUSINESS SECTION NO PASS'GR TIME	TOTAL PASSENGERS RECEIVED	EMPLOYED TICKETS	COMP. TICKETS	TRANSFER TICKETS	HALF FARE TICKETS	5 CENT TICKETS	NO CASH HALF FARE	5 CENT CASH FARES	CASH COLLECTED 5 CENT FARES	HALF FARE CASH COLLECTED	
1	U				FOLD HERE									
2	D													
3	U													
4	D													
25	U				FOLD HERE									
26	D													
27	U													
28	D													
29	U													
TOTAL														

SUMMARY

EMPLOYED TICKETS _____

COMP. TICKETS _____

TRANSFERS _____

HALF FARE TICKETS _____

FIVE CENT TICKETS _____

CASH HALF FARES _____

5 CT CASH FARES _____

TOTAL PASSENGERS _____

NO. PAS. _____

CONDUCTOR _____

RELIEVED CONDUCTOR _____

PUNCH MARK

TOTAL CASH \$ _____

BADGE NO. _____

SEE INSTRUCTIONS ON OTHER SIDE

[illegible]

FIG. 94.—Records filled out by conductors in San Antonio. The upper blank is the trip report; the lower blank is the car record.

doing, the city fares collected in Detroit, Toledo and Cleveland are registered on three separate registers. In this case, each register is marked with the name of the particular city in which it is used, a special operating mechanism being used to avoid three sets of cords or rods.

Fare Receipts as Shown on Conductor's Day Card and Register Checks.—The types of conductor's day cards or trip reports vary so greatly that only a couple of them will be reproduced as examples of the fare collection data expected from the conductor. They are shown in Figs. 93 and 94.

The greatest possible simplicity in the day card of the Boston Elevated Railway is obtained by using a separate one for each route number. This division is desirable since the route numbers are far in excess of the routes themselves, due to short-line cars, etc. Both revenue and mileage are segregated according to route numbers. Instead of using a large complex form, the company provides a double-leaf form which is folded horizontally to expose the page marked "A" in the accompanying reproduction. Page "A" is the detail statement of cash and ticket fares and transfers per half trip, spaces being left for both the receiving and auditing departments. The back of page "A" is blank. Page "B" is devoted to the conductor's analysis of cash deposited and to the receiver's check on same. Page "C," the back of the form, is a summary of collections, starting times and car number per half trip.

A trip report of more typical form, with corresponding car record, is shown in Fig. 94 and is that of the San Antonio Traction Company.

CHAPTER X

PUBLIC RELATIONS

In its broadest sense the term "Public Relations" as applied to privately owned electric railways would cover the entire politico-economic status of public utilities as such. In this volume, however, only day-by-day matters will be treated. The topics follow:

- Courtesy First.
- Managerial Powers.
- Service Improvement Bureaus.
- Making Change.
- Co-operation with Teamsters and Vehicle Owners.
- Public Referendums.
- Lost and Found Department.
- Waiting Stations and Shelters.
- Car Letter Boxes.
- Public Relations and Safety.
- Safety Equipment.
- Safety Islands and Zones.
- Helping Civic Movements.
- Railway Personification, Symbols and Slogans.
- Relations with the Press.
- Concentrated Publicity.
- Company Publications.
- Public Ordinances and Company Regulations.

Courtesy First.—The employees of a public service corporation should be courteous as a matter of course. Yet when less than a decade ago the Hudson & Manhattan Railroad said, "The Public Be Pleased," the lay world took up the cry as something entirely new. To be sure, there have always been courteous as well as surly employees. Without any set teaching in the art of Lord Chesterfield we find French-Canadian and Southern conductors more urbane than their fellow-worker in the land between. Yet, though courtesy is largely a matter of native character and environment, a railway can do much by picking men of the right bearing, by ever advocating courtesy, by polite wording of all announcements, and, above all, by setting an example in the acts of the ranking officers.

As courtesy toward others has its foundation in self-respect, the men should be neatly uniformed, provided with good carhouse quarters and addressed in a way due to men of intelligence. As the trainman, especially, receives the passenger's complaints directly, courteous action should be made easy for him. A placard in the car or a card which he can give out

when needful should state clearly that the company and not he is responsible for the rule in dispute. Few men can remain sweet-tempered through a dozen arguments with smokers, transfer abusers and wrongly routed passengers.

Is courtesy worth while? The answer is found in the fact that the Hudson & Manhattan Railroad could raise fares from 5 to 7 cts. without substantial public opposition. The courtesy policy had bred in the public a state of mind which permitted this life and death question to be settled purely on its merits.

The rare popularity enjoyed by this company is due largely to the deportment of the trainmen, among whom a courtesy campaign is carried on at all times.

Advice to be courteous is driven home to each new man by a personal talk with the superintendent of transportation, during which it is explained that while Marshall Field's epigram that the "customer is always right" may not be literally true, the presumption is that passengers do not complain without grievances, and that any discourtesy will bring discipline.

New employees are taken only on ninety days' probation. During this time they are watched carefully. Should complaints be made against any of them the first case means a personal talk with the superintendent of transportation. If a second complaint of any serious nature is received during the man's probation, he is dropped forthwith. The principle is that the trainman is paid to take knocks. The mere fact that he has got into a dispute with a patron is ground for believing that he will not make a good trainman.

Such drastic procedure is not followed, however, with older trainmen. Alleged discourtesies are investigated, and when it is found that the trainman has been goaded into making a retort by a disagreeable passenger, he is disciplined only to the extent of receiving demerits on his record. If such disputes occur several times, it is clear that the trainman is not living up to the spirit of the rule and he is dropped. Discharges for discourtesy are bulletined.

The conduct of trainmen is checked also by a system wherein trainmen are observed about once a week. These observations are made by the trainmaster, the motorman's instructor and the dispatchers who ride the trains and fill out cards on which there is space for the identification of the trainmen and a "test number" which refers to a printed list of 102 tests covering all branches of the service. These items include treatment of passengers, neat appearance and the like.

Courtesy at Rochester.—On the New York State Railways—Rochester Lines—it is held that during the first six months of service men make mistakes rather through lack of knowledge than through wilfulness. This

company has used the merit and demerit system of discipline since 1906. A man who acts worthily receives credit marks upon turning in a card requesting them, or else upon the report of an official. Five to twenty credits go for special politeness or courtesy to passengers or for using good sense in soothing a rider with real or imaginary grievances.

In the discipline of new men no demerits are applied except for distinctly wilful acts. Most men who enter the employ of a railway are inexperienced in dealing with the public as wisely as a storekeeper deals with his customer, so they are likely to be hasty in act or in speech. Nothing is gained by summary dismissal of such men as the chances are that others taken in their stead would be equally liable to commit the offence. Hence it is held much better to keep the first man, provided that under proper training he can be taught to govern himself.

From the beginning every trainman is made to understand that while on duty his acts are not his own but the acts of his employer. Praise for work well done does not spoil the men although they are not bashful in applying for credits.

Veterans whose long service should inure them against tiffs with passengers are disciplined invariably when insolence is involved. Twenty demerits are given for insolence classed as serious, a net total of sixty demerits being required for dismissal. However, the use of such phrases as "step lively" is not classed as objectionable conduct.

Where it is found that a trainman has been nagged by a passenger to such a point as to make a sharp retort natural, the discipline is left to the judgment of the head of the service improvement department. Where the complainant demands discipline for an employee when the company believes it is not deserved, the service improvement department settles the matter by personal calls or by a meeting between the employee and the complainant.

Courtesy at Columbus.—In Columbus, Ohio, a definite courtesy campaign was begun in 1913. As a first step, pamphlets on courtesy were sent to all the employees. Each one was also presented with a bronze watch fob with a leather strap. One side of the fob read "Safety First;" the other, "Be Patient, Courteous and Attentive." The distribution of these pamphlets and fobs is continuous, all of the employees receiving them. In addition, weekly "Safety and Service" meetings are held between the operating officials and the traffic inspectors and transportation foremen.

Courtesy on Other Lines.—Courtesy cards have been used with success by several lines. The Twin City Rapid Transit Company has posted in all stations, clubrooms and other places where employees gather, a placard calling attention to the necessity of a courteous and cheerful attitude toward the public, especially with regard to answering questions.

Talks on courtesy and the proper treatment of passengers are also given at periodical intervals to the men at each carhouse on the system. In these talks the officer making the address reads the complaints made against the individual men at that carhouse, but without mentioning the name of the offending trainman. He then explains how the case should have been handled.

The Federal Light & Traction Company also uses the poster plan for all of its properties. This has produced good results largely through showing the public that the company was anxious that its men should accord every courtesy to its patrons. As a matter of fact the public press of every town in which the Federal company has a property gave space to a notice regarding the use of a card. One of the editorial comments stressed the fact that the company, by trying to obtain courteous treatment of the traveling public, conferred a benefit on the town because visitors would be favorably impressed with the actions of the street railway men.

Railways also use their employees' bulletins for courtesy instruction and appeals. A feature on the bulletins of the Interborough Rapid Transit and New York Railways is a page, "Pleasing the Public," in which are entered such matters as letters from patrons praising the action of the Interborough employees, acknowledging the receipt of lost articles and the like. Where a correspondent does not know the name of the employee about whom he writes, the man in question is traced and his name published in a note beneath the letter.

On the Memphis Street Railway the "safety first" organization has aided to advance the principles of courteous treatment of the public. This is accomplished by addresses from officials before the safety committees formed among the employees. The same results have followed on other roads.

A courtesy example of tangible type is afforded by the Metropolitan Street Railway, Kansas City, Mo. For five years past this company has taken special pains to handle the Christmas traffic in the Christmas spirit. A week before Christmas the company picks twenty of its most gentlemanly conductors and stations them at busy corners to assist people onto the cars. These men are in full uniform, and in addition wear white gloves—which are kept white through renewal when necessary during the day, so that the clothing and packages of the passengers assisted may not be soiled. The most valuable service of these men is in helping the children who throng to visit the stores. The conductors stand at the points where the rear ends of the cars would stop, and their only duties are to hold packages while people get on the cars, assist the passengers, expedite the movement by calling the names of the cars and answer questions. They do not collect fares. They are on duty as

late at night as shoppers crowd the streets, and until midnight Christmas Eve. The "front-end fare collectors" are on duty also, at downtown corners, in greater numbers than usual.

The distribution of souvenirs to ladies on appropriate occasions is another example of courtesy. Some companies like the Menominee (Mich.) & Marinette Traction Company have distributed carnations or other flowers on Easter Sundays. Others like the Illinois Traction System have presented hatpins on Memorial Day. Such gifts are simply courtesies and not "Safety First" reminders or the like.

Managerial Powers.—The most important factor in good public relations is to allow the manager a large degree of initiative. Companies which operate in whole groups of towns must be careful so to organize their business that the benefits of centralization of engineering and purchasing will not be more than offset by less freedom for the local manager. The latter should be far more competent to judge the merits of certain forms of co-operation with the public than a distant and often unsympathetic central bureau. Freedom for the manager is still more essential in the case of small isolated properties which are controlled by syndicates. Nothing will bring the company into disrepute quicker than a realization by the citizens and employees that the manager must write to somebody 1000 or 2000 miles away before he can take a step of any importance. The smaller the town the more the citizen thereof resents the idea that anything that he wants is decided for him by someone a total stranger to the town.

One of the worst cases of disregard for public relations is the following:

A certain syndicate took over the railway system of a flourishing town of 50,000 people and an almost equal amount of tributary population. The manager of the property had been connected with it for more than ten years, was personally known and liked by almost everybody in the district, and through his splendid work on hospital, fair, carnival, and other committees, had become known as one of the most public-spirited men in the community. Although the property was unionized, he never had the slightest friction with the men. As this company had a great deal of sparsely settled territory, it was not a great money-maker and so could not give its patrons the best in everything. But these shortcomings were overlooked because the townspeople felt that a reflection on the railway was a reflection on their personal friend, the manager. In spite of this ideal condition the first act of the syndicate was to discharge the manager to save (?) money by substituting a cheap superintendent who would be directed from the central office of the syndicate. The unpopularity of the act was increased by the fact that the central office was located in a rival though larger city!

Another example of thoughtless policy concerns a Southern city.

The manager was not an engineer, but most popular with the men and the public. He was replaced by a man capable as an engineer but not as a judge of Southern feelings. First, he antagonized the public by trying to break down the Jim Crow barriers on busy days. Then he called forth a long, bitter and costly strike by hiring men of a much lower type than were before employed on the property. Is it any wonder that the citizens overlooked the improvements in roadway, power and rolling stock?

Service Improvement Bureaus.—The formal creation of a distinct bureau for settling complaints is quite a recent step toward better public relations. In Rochester, the home of the first bureau, this feature is called the service improvement department. To it is assigned all the work of handling complaints, returning excess fares, settling transfer disputes, discussing with vehicle owners the delays due to trucks on the company's tracks, etc. One of its cardinal principles is that no complaint must ever be dropped, until it is either settled satisfactorily or else has reached an *impassé*. All complaints are acknowledged at once and an investigation is begun in the department involved. At the close of the investigation a personal call is made upon the complainant and the situation is explained to him with perfect frankness. No attempt is made to settle the matter by mail, as letters are always open to misconstruction. Chronic kickers are followed with perfect patience and their complaints, under this general treatment, have been greatly reduced in number.

The service improvement department was first established Feb. 1, 1911, as a complaint department, and the work was handled by the chief clerk to the vice-president. After Oct. 1, 1911, the work was handled with that of the claim department because many complaints developed into claims. In August, 1912, the name was changed to "service improvement department" but the work was still handled with that of the claim department. On Apr. 1, 1913, the organization became a separate department, whose head was placed in charge also of the land and tax, insurance and special service departments.

The department consists of its head who devotes part of his time to the work, a stenographer and two outside men who call upon patrons, either to receive complaints or to satisfy complaints after investigation. The outside men also interview any witnesses furnished by the patrons or employees against whom complaint is made. Employees are encouraged in case of any dispute on a car to secure the names of witnesses to protect themselves just as they would do in case of accidents.

Complaints or suggestions for the betterment of the service are received by letter, by telephone or by personal calls. After office hours patrons may notify the telephone operator who takes the name and address of the complainant. A member of the service department makes

a personal call on the following day to get the details. Thus patrons can reach the service improvement department 24 hr. of every day in the year.

The number of cases where the complainant does not express himself as satisfied at last is trifling. As many as 2000 cases have been handled in one year. Those who have occasion to make a second complaint are usually found to do so in a spirit altogether different from their first protest. Moreover, the attitude of the public toward the company has become more kindly because patrons call attention to little grievances immediately after their occurrence and before the aggrieved person has a chance to exaggerate their importance.

Complaint Handling at New York.—Although the New York Railways Company has no special department for handling complaints, it has established a system under the immediate supervision of the general manager for their receipt and correction. In the case of telephoned complaints it is the rule to request the complainant for a written confirmation since a letter tends to establish the fact that the report is made in good faith. In the case of oral complaints made by personal calls at the company's offices, the statements are copied in typewriting. Most complaints are received at the division offices of the company located in the various carhouses. Therefore, a copy of each complaint is sent immediately from the division office to the office of the general manager. There its receipt is at once acknowledged in a courteous letter to the complainant. Following this an investigation is made by the transportation department and a report of the investigation, together with a statement as to the action taken by the division superintendent, is sent to the executive office. Should the conditions warrant, a statement covering the investigation and outlining the action taken by the company is sent to the complainant.

Complaints made by mail are acknowledged in the same way, and a copy of the complaint and a copy of the acknowledgment are sent to the division office for investigation and report. From this point the procedure is the same as that outlined in the case of oral complaints. Most complaints are answered over the signature of the general manager.

The complaint organization consists of a single clerk who devotes his whole time to the work and is thoroughly experienced in dealing with the public. Several transportation employees devote part of their time in calling upon complainants when this is necessary to adjust the discrepancies that sometimes exist between the testimony of the complainant and that of the accused employees. One of the assistants to the general manager also devotes a large part of his time to this work, especially for check and criticism of the complaint clerk.

Each month all of the complaints received on each division are tabu-

lated. Thus a competitive system is set up between the various divisions. In these tabulations the complaints are classified under a series of headings such as "insolence," "short change," "transfer dispute," "erroneous information," "neglect of duty," "premature starting," etc., and the result of the investigation is given. In one month, for example, about 200 complaints were received on the whole system. In 42 per cent. of these the employee was found to be at fault and was disciplined; in about 27 per cent. of the cases the passenger was at fault, and in the rest the data furnished by the complainant were not definite enough to determine the identity or the fault of the employee. A notation of the facts in each case is entered in the record of the employee involved, and this record has a strong bearing on the continuance of his employment. Praise as well as blame is invariably entered.

Another angle of this work covers fare-box and transfer disputes. If a passenger drops too much money in the fare box the conductor makes out a card with the passenger's name and address and the amount involved, as he has no power to make refunds, for obvious reasons. A report with the card attached is turned in to the receiver and cashier and from there sent to the division superintendent. If the passenger is found to be entitled to a refund, a memorandum of the facts is sent to the office of the general manager and the refund, in stamps, accompanied by a letter, is sent to the patron. Many letters praising the practice are continually received, as patrons often acknowledge the receipt of refunds. About 400 such cases are handled each month.

The same routine is followed where passengers inadvertently place cash fare in the box, and then tender valid transfers. A card with a passenger's name and address and a statement of the circumstances is sent through the cashier to the division superintendent for investigation and then sent to the office of the general manager. Usually, in transfer disputes, the practice is followed of making a refund on a transfer whenever there is reasonably clear evidence that the passenger is acting in good faith.

A third section of complaint work on the New York Railways is that of collisions with vehicles. Serious collisions, of course, are referred to the claim department, but in minor cases a letter is written to the owner of the vehicle giving details of the collision, including vehicle numbers. The object of sending these letters is to acquaint the owner with the actual conditions even though no claim for damages is made, for in this way careless drivers can be located and eventually eliminated.

In one case a wagon driver called at the railway's office and stated that upon receipt of the company's letter regarding a collision between his wagon and a car his employer had scolded him severely for his carelessness, had handed to him a set of traffic rules to study, and had in-

structed him to call upon the general manager of the railway and offer to pay for the damages done to the car. The driver said that his earnings were not large and that he hoped the company would not be too severe with him. He admitted his fault and said that this was his first collision, although he had been driving for his present employer three years. He was told that the company did not want to inflict any hardship on him and would not require him to pay for the damage done. He left saying that in the future he would take no chances with street cars and expressed his gratitude for the consideration shown him.

Denver Complaint Practice.—The Denver Tramway treats complainants on the assumption that they are always right. Grievances received by mail are sent at once to the various divisions for report, while those registered in person or by telephone are taken down verbatim, typewritten and treated in the same way. After each investigation has been completed, the complainant is advised by mail as to the results. Where trainmen are found in the right, the complainant is so advised in courteous and inoffensive terms. Such methods are adopted to discourage exaggerated or false statements. Where fault is attributed to the trainmen, a letter of regret is forwarded to the complainant with an assurance that the matter has been effectively taken up with the offending employee.

In cases embodying serious charges, the names of witnesses are required from trainmen. The importance of this procedure is so well known by the men that such names are invariably procured at the time difficulties of this kind occur. These are promptly forwarded to headquarters, together with the reports of trainmen. Written statements are then requested from such witnesses, in order that the company may have, along with the assertions of complainant and employee, the additional data available from unbiased parties.

All complaints are noted upon the records of employees, with added statements covering the result of each investigation. Every trainman knows that too many such notations upon his record bode him no good. Even though he might have acted within his rights in all cases, it is assumed that his manner and bearing must have been offensive to some extent, if complaint is inspired. Such notes carry much weight in fixing a man's fitness to deal with the company's patrons, since courtesy toward and accommodation of passengers are two big features of up-to-date operation.

The Brooklyn Rapid Transit Company's complaint department is in charge of one of its vice-presidents. While all complaints are handled by clerks, they are acknowledged by this vice-president direct. Personal calls are made by the complaint clerk where the complainant feels so hurt as to extend the correspondence unduly. Transfer disputes and cases

of fare over-payment also are handled by this department, refunds being made by sending 5-ct. tickets.

Complaint Handling at Boston.—On the Boston Elevated Railway mail complaints are acknowledged from the office of the superintendent of surface lines or by the division superintendent affected. If the patron is very angry he may discuss his views in person with the superintendent of surface lines, his assistant, or the division superintendent concerned. All complaints are numbered in order and indexed on cards to furnish a means of making monthly comparisons of troubles, localities, etc. Complaints received at the main office are sent to the division superintendent for study and report, followed by a review of the case by the superintendent of surface lines. A complex affair is usually put up to the discipline committee. This committee consists of four operating officials who meet daily at the main office. If it is necessary to bring the employee and the complainant together to clear up the case, the company tries to do so. Even anonymous complaints are followed up, but these do not furnish as satisfactory a basis for action as those which are signed.

Complaint Handling on the Hudson & Manhattan.—On the Hudson & Manhattan Railroad, New York, complaints are handled personally by the president. About fifty complaints are received in a year. Of these about 10 per cent. relate to details of the service, and the rest are aimed against employees. The sources of most of the latter are failures of car doors to open and the calling back of passengers by ticket choppers at the platform entrances. About half of these complaints are found to be groundless. Complaints about the service are discussed with the superintendent of transportation, and if they contain practical suggestions, for the benefit of the service these are at once tried out. Complaints about any transportation or station employee are noted on his record, and when the nature of the offense warrants strong corrective measures, demerits are entered in addition.

Complaint Handling at Utica.—For fare and transfer disputes the New York State Railways—Utica Lines—devised this plan in 1908: The conductors are furnished with three small blank books containing slips which can be torn out and handed to the complaining patron. Two of these provide for over-payments of fare and for other classes of complaints. The third slip provides for statements of conductors who are involved in disputes. The records of the company show that more than 50 per cent. of the slips issued by conductors are never returned, indicating that half the complainants concluded on second thought that their complaints were unjustified. Later the use of these blanks diminished greatly, as the public became better acquainted with fare and transfer regulations, etc.

Value of Service-improvement Department.—One great merit of a service-improvement department is that it will deprive the local or state regulating boards of thousands of petty and even major cases. Recognition of this fact and the desire to settle dissatisfaction as quickly and amicably as possible led the International Railway, Buffalo, to formulate a "gentlemen's agreement" with the important civic bodies of Buffalo. It is understood that these bodies will offer to the president of the company any complaints, suggestions or requests for adjudication before going to the Public Service Commission.

To Conclude.—It is clear that even if some formal department is not in being because of the smallness of the property, there should always be available at the company's telephone a courteous employee who can start in motion the machinery of correction and satisfaction. In the case of personal complaints, the company representative should be a person of resounding title and ample discretion. It is hardly necessary to follow the example of one company whose president is accessible to the public between 10 a.m. and 4 p.m. As a result many a conference of department heads and much other important business has suffered delay because the visitors overstayed their time.

Information during Blockades.—A common source of friction with the public was the old version of Rule No. 55 of the rule book of the American Electric Railway Transportation & Traffic Association, which prohibited employees from giving facts on traffic delays to any but authorized officials of the company. Of course, there are many good reasons for this rule from the standpoint of discipline and final legal consequences; but nothing is more exasperating to passengers than to sit in a stalled car in ignorance of the cause of their plight or of how long the delay is likely to last.

Literal obedience to the old rule has caused thousands of such annoyances, small in themselves but big in their cumulative effect. The plain remedy is to frame rules of this kind so that they may be interpreted with some degree of tact. In the first place, the platform man should be taught to take a sympathetic rather than a sarcastic attitude toward the marooned patron. He should explain the difficulty of securing exact information quickly, and as soon as he does learn the expected duration of the delay he should have the authority to give it out.

That sentiment on this practice is changing among railway men is clear from the action of the 1914 convention of the Transportation & Traffic Association which amended Rule 55 of the city code to read "Motormen or conductors may when necessary, however, advise passengers as to the general cause and probable duration of a blockade." The original rule read:

"Motormen or conductors must not under any circumstances give any information whatever concerning any accident, delay, blockade or mishap to any person except to properly authorized representatives of the company."

Making Change.—An occasional source of friction with the public is difficulty in making change. No matter how much change a conductor should carry, within reasonable limits, it is obvious that he cannot continue changing large bills without running out of fractional currency. In many states a statute provides that the conductor need not furnish change if a bill larger than \$2 is tendered to him in payment for fare. The proper plan, if a bill larger than the statutory amount should be tendered and the conductor cannot change it, is for him to tell the passenger so and give him the choice of getting off the car and getting the bill changed or of letting the conductor keep the bill and give a receipt for it so that the passenger can get the correct change at the main office. The San Antonio (Tex.) Traction Company furnishes its conductors extra change at the downtown office if they telephone via the dispatching system that they have run short. This plan helps in the solution of this question.

Co-operation with Teamsters and Team Owners.—So many delays to traffic are due to the slow-moving truck and its preference for the track as a place on which to break down, that improvement in this respect is highly to be desired.

The New York State Railways—Rochester Lines—has made it a point to advertise exactly how the service is affected by interruptions due to teaming. The following is a typical advertisement as published in a Rochester labor paper in March, 1914.

"WHY WE ASK FOR CO-OPERATION

"Following is a list of interruptions to service during the past fourteen months:

Date	Interruption
January, 1913.....	9 hr. 56 min.
February, 1913.....	4 hr. 55 min.
March, 1913.....	8 hr. 25 min.
April, 1913.....	2 hr. 41 min.
May, 1913.....	4 hr. 9 min.
June, 1913.....	9 hr. 53 min.
July, 1913.....	8 hr. 46 min.
August, 1913.....	4 hr. 11 min.
September, 1913.....	10 hr. 15 min.
October, 1913.....	6 hr. 29 min.
November, 1913.....	4 hr. 47 min.
December, 1913.....	6 hr. 10 min.
January, 1914.....	9 hr. 22 min.
February, 1914.....	3 hr. 51 min.

Total for fourteen months..... 93 hr. 50 min.

"These interruptions, which total almost four days, were caused by wagons and autos breaking down or becoming stalled in the car tracks.

"Every interruption results in twofold inconvenience to our fellow citizens: They cannot reach their destinations on time, nor can they be sure of riding in comfort because of the crowding which invariably follows when cars are bunched.

"These are the reasons why we ask drivers of vehicles to co-operate with us in an effort to bring the number of interruptions down to the minimum.

"This does not mean that the car tracks should never be used by drivers of vehicles.

"We know there are times when drivers cannot reasonably be expected to drive elsewhere.

"The motorman, who is himself a driver, knows this too. He doesn't ring his gong for the purpose of annoying a fellow-driver. He rings his gong simply because it's the only way he has of asking you to co-operate with him so he can land his passengers on time.

"If drivers of vehicles will use the car tracks only when necessary and will turn out for cars to pass whenever they can do so without risk of damage to their vehicles, we will appreciate their co-operation because it will reduce the number of interruptions and enable us to give the people of Rochester better service."

NEW YORK STATE RAILWAYS
(Rochester Lines.)

The Twin City Rapid Transit Company for several years has published from day to day, as occasion has required, a "car delay" advertisement in six of the daily papers in Minneapolis or St. Paul. No delay is announced unless it has been for ten minutes or more, and all delays, whether they are the company's fault or that of others, are recorded. In the latter case the name of the person or company through whose fault the delay occurred is not mentioned, for obvious reasons. These announcements, like all of the other advertisements published by this company, include the statement "complaints and suggestions always receive courteous attention."

Public Referendums.—Many questions in railway operation are necessarily matters of pleasing the majority only. Some prefer smoking, others do not; so too there will be divisions of opinion about the spacing of stops, routing, schedules, etc. A few railways have called for public referendums to aid in solving these puzzles for the benefit of the majority. A referendum also is a good way to side-step the "Improvement Associations" made up perhaps of one lawyer and six realty promoters, yet more active than 1000 citizens with no axe to grind.

The public referendum or popular vote constitutes indirectly a method of handling complaints *en masse* that has been treated rather gingerly by the electric railway industry as a whole. Apparently, referendums have been held during the past four years in only four cities with the exception of those on the skip-stop, as described in Chap. IV. Of these other referendums Brooklyn has had two, one relating to the near-side stop and the other to a proposed new route.

In both of the Brooklyn referendums ballots 5 in. by 3 in. in size, with space for the name and address of the voter as well as his decision as to the matter at issue, were distributed by all conductors. Voting was carried on for two days in the first referendum, but only for one day in the second one. Ballots were collected by conductors, inspectors or ticket agents, or received by mail at the general offices of the company. All unsigned ballots were rejected. The public was prepared for the vote by advertisements in the daily papers setting forth the details of the proposal, as well as by car posters. Both referendums are considered to have expressed definitely the wishes of most of the riders, the result of the vote on the near-side stop constituting, in all probability, the main reason for the later adoption of this scheme in Greater New York. The total vote was equal to 11 per cent. of the total traffic for one day, or 22 per cent. of the total number of one-way riders. Duplication of votes was reduced because the signature and address were required on each ballot.

The popular vote conducted in Kansas City, Mo., was on the question of smoking on the cars. This matter had been agitated for some time prior to June, 1912. The company conducted a referendum for a whole week, passengers receiving ballots upon payment of fare. These ballots contained the printed words "yes" or "no." One of these was marked by each voter and the ballot deposited in boxes which were located one at the exit and the other at the entrance of the car. The interest with which the referendum was received was indicated by the fact that more than 60 per cent. or 1,500,000 riders voted. About 60 per cent. of the votes were against smoking on cars. As a result of the vote, the City Council repealed an existing ordinance. Despite strong opposition, encouraged by the manufacturers and dealers in tobacco, the "no smoking" rule was maintained and is now in force. The referendum cost the company about \$3000.

In 1914, the re-routing due to the opening of the new union station at Kansas City, Mo., met with enough objection in one instance to cause the feasibility of a change to come up. This case was that of the Independence line, which had been re-routed to enter the business district three blocks south of its former course. The board of control planned the following system of disclosing the facts as to the logical routing. Cards were printed with blanks on which passengers from Independence and vicinity indicated their destination in Kansas City. These cards were handled by employees of the electric railway company or the municipal or board of control, who ascertained the facts from the passengers, the inspectors noting also the point at which the persons boarded the cars. The suggestion that the passengers on the Independence cars vote direct as to their preference in routing was rejected because business interests or

associations might have influenced the vote and the result would not have indicated the logical route.

The first referendum held at Denver was on maintaining the skip-stop on one of the lines. This was conducted by means of return postcards which were mailed to some 9600 householders who used the routes affected. About 5600 replied, 30 per cent. against the skip-stop and 70 per cent. in favor of it. The final action of the company on the question, however, was complicated by premature action of the local government, although later the skip-stop was introduced on other lines.

The second referendum at Denver was conducted Aug. 23, 24 and 25, 1915. Ballots were handed to all cash passengers who marked them for deposit in a platform box. This referendum was on stops, showing 252,586 votes for the near-side and 149,692 votes for the far-side stop.

In Boston a referendum was held regarding the relative desirability of two proposed locations for an easterly terminal for a new subway. Notices outlining the various points in favor of each station were posted on all inbound cars on the affected routes. Upon the arrival of the cars at the downtown district, they were boarded by uniformed employees who gave to the passengers printed ballots indicating a choice of route. The ballot was perforated across the middle so that either half could be used and the other half destroyed. Upon the arrival of the cars at the terminals ballot collectors in uniform on the platforms and stairways gathered the slips from alighting passengers.

The balloting was continued for three days, about 69,000 votes being cast. As the opinion of the voters was almost evenly divided, the result was considered indecisive. The company's officials also were of the opinion that the chance for repeating votes afforded by limiting, necessarily, the balloting to the business district made such a vote less useful than it would have been in a home section.

Lost and Found Department.—A "lost and found department" should be a regular feature of every railway. Platform men should be instructed to turn in any article no matter how petty it may seem. Embroidery, lacework and knitting may be of great sentimental value to the losers although of no value to the finders.

New York Practice.—On the New York Railways lost articles are turned over at the end of the trip on which they are found to the fare receiver at the terminal carhouse. The receiver then makes out a lost property coupon in triplicate, upon which is given the date, the line, the time of finding the article, the number and direction of the car in which it was found, the name of the employee who turns it in and a description of the article. These coupons are made up consecutively in book form. The original and the duplicate are torn out of the book and sent with the article by the depot messenger or wagon, on the morning following the receipt of

the lost article, to the lost property room. There the original of the coupon is retained with the lost article and the duplicate coupon is received by the lost property clerk and sent back to the depot where the article was first turned in. As soon as lost property is received a search is made for clues as to the ownership. If these are found, the addressee is asked by postcard to call at the lost property room and identify the article. When a claimant calls, he must give the information written on the coupon attached to the lost article. If he can do so, he signs the coupon as a receipt and receives the article to which it is attached. If full descriptions of lost articles are given by mail by claimants who live out of town the articles are forwarded in any way that the owner may desire. New Yorkers, however, must call in person.

Property not reclaimed within six months is sold for the funds of the employee's benefit association. This procedure is in accordance with the Railroad Law of the State of New York. About 75 per cent. of the lost articles go back to their owners within three months. Stored articles are classified according to the lines on which they are found. The lost property room is in charge of one clerk, who maintains a register which shows the date upon which the article was found, the line upon which it was found, a brief description, the date upon which it was received, the date upon which it was turned over to a claimant, the name and address of the claimant and place for remarks regarding the transaction.

Where rewards are left by claimants, record is made in a separate book to show the date when the reward was offered and its amount, together with the coupon number of the article, the badge number and the name of conductor finding the article, the date when the reward was turned over to the conductor and the signature of the conductor receipting for the reward. About one article in fifty involves a reward for the finder.

Boston Practice.—In Boston when an employee finds an article, he assumes the care of it and upon reaching the carhouse, fills out a tag to tie to the article, but retains a stub. The stub goes to the receiver who forwards it to the lost article clerk in the office of the superintendent of surface lines. Receipts are given for all such articles. Articles are classified, the valuable articles going to the treasurer after a brief stay on the original division. Lost and found advertisements in newspapers are read in addition to reading the usual letters from claimants. Of about 3000 articles handled annually, 45 per cent. find their owners. The department costs the Boston Elevated Railway \$2200 a year for forms and labor, but this cost is treated as good-will advertising.

Cost of Handling Lost Articles.—Owners of articles thus restored often leave a reward for the finders, but very few realize that the expense to the company in collecting, checking and returning these articles amounts to much more than was paid for fare by the absent-

mindful passenger. When it is considered that only half of the articles are claimed and that a great deal depends upon the honesty of conductors, the question may well be asked whether it is to the company's interest to maintain any but a simple system which will cover the loss and will insure the recovery of articles which have been turned in if they are called for. Yet some railways, as Baltimore, go so far as to advertise the lost articles. A company that is obliging enough to conduct a lost and found department should not hesitate to tell the public from time to time what it pays out for this purpose.

Waiting Stations and Shelters.—Waiting stations or shelters are, of course, more usual on interurban lines than on city railways, and they have even been erected on many suburban lines at transfer or other points as a protection to waiting passengers against the inclement weather. They would probably be built more often by the railway companies if a company could be assured that such shelters would receive decent treatment from the public. Unfortunately, experience has shown that in many communities a small proportion of the public will take pleasure in wantonly injuring and defacing structures of this kind, especially those in isolated localities.

Such stations need not be elaborate, and at places where comparatively few people at a time would be likely to use such a shelter, the best form of roofed structure is probably that whose plan is in the form of an X. Such a shelter gives protection from a storm regardless of its direction and is more easily cleaned than an inclosed building. This design also has the advantage that waiting passengers in a lonely place are not forced into as intimate contact with each other as they would be in the ordinary form of building.

At points where the traffic is considerably larger, some interurban railway companies have adopted the plan of inducing outside persons to bear the expense of erecting the building in return for store privileges. Under one such agreement the company gives the contractor the lease for five years of the ground. The contractor erects the station, which is large enough to include a store and a dwelling. He also acts as the company's agent and is paid by the company by receiving free rent for the building and also a certain percentages of all outgoing railway business emanating from his station. This is an inducement to increase both the passenger and the freight business by local solicitation. In the agreement cited, a minimum compensation is guaranteed to the agent.

Two typical interurban waiting stations are shown in the lower views of Fig. 95. One is inclosed, the other is of the X plan type. Both are on the Kansas City, Clay County & St. Joseph Railway.

On the Pacific Electric Railway most of the way stations have been erected of reinforced concrete. A standard design with an overhanging

roof has been adopted for important points. Reinforced concrete has also been used for the shelters at crossroads and the permanence and



FIG. 95.—Upper view shows waiting station at Hartford, Conn., built by city. Lower views show inclosed and "X" plan stations on Kansas City, Clay County & St. Joseph Railway.

beauty of these small structures has added greatly to the prestige of the line with the public. Two such stations are shown in Fig. 96.



FIG. 96.—Small concrete waiting stations on the lines of the Pacific Electric Railway, Los Angeles, Cal.

In the United States shelters within city limits are somewhat unusual, although common abroad. However, there is one in Hartford at a main

loading point of the local lines of the Connecticut Company. The shelter, which cost \$2100, was built by the city of Hartford as a convenience for its citizens. In the Philippines torrential rains are common, making it difficult to transfer passengers during the rainy season. For this reason the Manila Electric Railroad has erected at five main transfer points in Manila shelters that are located between double tracks or at turn-outs and have roofs extending over the tops of passing street cars. As the shelter roofs are carried out beyond the center lines of the cars there is no drip from the eaves upon boarding passengers, and transfers can be made from one car to another without a wetting, no matter how severe the rain. The structures are of the simplest character. The roof is of the "inverted umbrella" type and is supported at intervals by posts on the center line. The platforms are raised enough above the street level to insure a dry footing.

Very recently the Worcester Street Railway put up a handsome open-air shelter of pergola type along a parkway in a residential quarter. Flower-beds and shrubbery and outside benches complete this contribution to civic beauty and railway utility.

Car Letter Boxes.—A decade ago there was a cry for letter boxes on cars, and a number were placed on cars in several cities. Fortunately the movement did not spread. Generally letter boxes are so numerous there is no reason why this trifling convenience should be allowed to slow up car service.

Public Relations and Safety.—Safe operation is one of a railway's best assets in holding the good will of the public; but not until the safety first movement was inaugurated did safety first discussion get beyond addresses to the platform employees. It seems a waste of words to say that the first essential to reaching the public by the safety first route is to begin by having the safest equipment. Even if the equipment fails to avoid injury, proof that the company used the best available equipment will aid to cut down the jury assessments in personal injury suits.

Safety Equipment.—The principal minimizers of run-down accidents are fenders and automatic wheelguards, the latter being used only where the cars run over paved streets. Clear sounding gongs on city cars and mellow horns or whistles on interurban cars are safety auxiliaries to warn the ear, while headlights are guardians for the eye.

Crossing signals may be named in connection with sound and light car signals. These have been perfected to an astounding degree to give imitations of swinging lanterns, wig-wags, etc., and do other work formerly left to flagmen. The use of overhead contact and track signal systems, as a safety measure of primary importance, calls for no comment here, as it constitutes a branch of railroading in itself.

Until recent days many car accidents were due to high steps. The

decisions of various public bodies indicate that the first step should not exceed 15 in. while succeeding steps should be lower. The carbody with ramped floor and the truck with small wheels have come to solve this problem for new cars, but old cars should be modified wherever possible in order to reduce heights to a degree that will remove all cause for complaint. For interurban cars, an extension step may be added for use at stops where there are depressions in wayside crossings.

The all-inclosed car in connection with folding steps has almost eliminated boarding and alighting accidents, which had constituted 40 per cent. of all accidents on some roads. When one considers that every accident is sure to make some enemies, the goodwill value of the all-inclosed car is evident. Add to this some arrangement for inter-connecting step and door operation to prevent power being applied while the door is open, and the ideal in respect to this class of accident prevention is obtained. In April, 1914, the Third Avenue Company, New York, installed folding doors and steps with a control interlock on a large number of its cars at an expense of \$324 per car and greatly reduced its platform accidents.

While the all-inclosed car has avoided many of the evils of previous types of cars, it has brought some problems of its own. One of these is that of the best way of avoiding a panic among the passengers. In one car a fuse under one of the seats blew out, and its careless replacement resulted in some flashes which burned the motorman and conductor slightly as they tried to correct the trouble. In the meantime, disorder prevailed among the passengers, who imagined there was no way to get out of the car except by smashing the doors. They did not even realize how easy it was to open the windows. Unfortunately, the motorman and conductor also lost their heads, and a serious accident was avoided only through the coolness of a policeman, who ran up to the car and pulled down the trolley pole. Of course, the fuse should not have been inserted with the power on, but a similar panic might have been caused by a fight or in a dozen other ways. For this reason instructions to the car crew only as to what to do in emergencies will not suffice. In all fully inclosed cars, it would be well to post notices over the place where the door-operating devices are installed, explaining how the doors may be opened, on the same theory that passengers on steam trains are kept acquainted with the location of the emergency levers of the air brake and of the emergency tool box.

Many interurban cars have a glass-sealed cabinet which contains an axe and possibly other tools for use in emergency. Red-cross type cabinets containing lint dressings and salves have also been devised in cheap form for electric railway use, particularly on high-speed cars operating

through sections far from medical help. These sets are so inexpensive they they are almost worth their cost as safety advertisements alone.

Safety islands and zones for folks waiting for cars are now in use on the Public Service Railway, Newark, and elsewhere. Usually such islands are elevated 6 in. above the curb or enough to be free from the errant automobile. Special lights, of course, are used at night. With the ordinary double-track arrangement the islands are placed in the middle of the street. In a few cases, however, both tracks are located nearer one curb, as alongside Prospect Park, Brooklyn and Central Park, New York. In that event, the island would be located outside the track farthest from the curb. In both track installations named one track is so close to the



FIG. 97.—Safety-first signs at Montreal to warn passengers not to board moving cars at park exit.

curb that passengers step directly from it to the car. An island in this case would afford the same easier step heights and safety from automobiles to the users of the outer track. Safety islands and zones for general use have been criticized by the Commissioner of Public Works in New York on the ground that they encourage people to cross streets while traffic is moving. This objection would hardly apply to safety islands intended primarily for street car patrons. These patrons have no control over the movements of the cars but have to board or leave them promptly when they reach their stopping points. Further facts on safety zones are treated in the chapter on "Accelerating Traffic Movement outside the Car." The Montreal Tramways has posted safety-first signs in French and English opposite the platforms at park exits, as shown in Fig. 97.

The Cleveland, Southwestern & Columbus Railway, the United Railways & Electric Company of Baltimore, and companies at Portland and Seattle were among the first to take safety campaigns to the public. Naturally, they began with the public schools. The first talks were given by the railway executives themselves, but it was soon apparent that the nature of lecture work and the time it would require called for the service of specialists. Gradually, this work has been extended from the children to their teachers and parents, then to the wagon and automobile drivers and their employers, then to the police and fire department and eventually to safety committees embodying every important interest of the community.



FIG. 98.—Selected views from a safety-first moving-picture film.

Interest in the subject has also been kept up by the distribution of blotters, pencils, notebooks, calendars, drinking cups, buttons, badges and other souvenirs to teachers and their pupils, of blanket safety-pins to teamsters, of flags and streamers to automobilists; of banners, streamers, slide exhibitions and moving pictures to the general public. A large variety of posters, circulars, etc., for car display and much newspaper advertising have also formed a part of safety campaigns. Through the National Safety Council, safety-first posters may be secured.

One way of retaining interest in safety has been to offer prizes to school children and even to the public at large, for the best safety verses or the best safety slogan. Thus in 1912 the Boston Elevated Railway paid \$700 in 208 prizes to 780 safety poets. In 1914, the Philadelphia Rapid Transit Company expended \$750 in a similar cause. The Knoxville (Tenn.) Railway & Light Company gave books of fifty tickets for the best essay from each class of children. Moving picture scenarios

have also been used at Brooklyn, Los Angeles, Pittsburgh, Montreal, etc. Typical views from such a reel are shown in Fig. 98.

In fact, the safety movement has become so ramified that many companies find it desirable to employ a secretary to co-ordinate all safety work within and without the organization. Indeed this is the only thing to do, for unless someone is devising or appropriating and exploiting new ideas in safety, the interest of the public will soon die out. Such a consummation would be very undesirable, for no other aspect of railway operation gives the management a chance to mix intimately with the biggest and most important groups of its patrons. As the interest benefited most greatly by reduction of negligence, the electric railway should lead in building up safety leagues which involve the co-operation of important elements of the population.

Much more can be done in the name of safety than in the name of improved service. For example, the near-side stop has been adopted in a number of towns purely on the ground of fewer crossing accidents. Further, by conference with citizens safety committees, bad paving and illuminating conditions have been brought to light and corrected to mutual advantage.

Helping Civic Movements.—The wise manager will identify his company with every non-political public movement that makes for a better city. There are many ways to do this at small cost. "Clean-up-day" is a most commendable institution; "Do your Christmas shopping early" breathes the spirit of true humanity and the campaign for a "Sane Fourth" surely deserves aid. Usually the club behind movements of this kind is glad to furnish the necessary posters, but even if the railway has to print them, the gain in favor among the public-spirited people of the community will make the cost worth while. The first references to this subject follow in connection with the use of transfer backs and placards.

The backs of transfers are most commonly used to state the penalties for misuse of transfers or to advertising something. It will be found desirable, however, to reserve a few days in the year for community service. Warnings against tuberculosis, small-pox and other diseases when printed on the backs of transfers do much to forward the work of government and voluntary health organizations. Transfer backs may also be used to convey holiday wishes to the patrons as at Christmas and New Year's. Sometimes the latter style of transfer is specially decorated. For example, the St. Joseph (Mo.) Electric Railway, Light & Power Company printed one in red and green with a border design of holly leaves and berries. At Kansas City, in the holiday season of 1914-15 the Metropolitan Street Railway, Kansas City, Mo., expressed Christmas and New Year's greetings as usual to all the passengers that took trans-

fers. During Holiday Week, the transfers said: "It is our wish that you enjoy a Merry, Bright Christmas and a Happy New Year." These words were printed in red ink; and in a corner of the space was a picture, printed in green, of Santa Claus astride a reindeer bearing a big sack of toys and waving a Christmas tree. The transfers were printed on stationers' bond, so that even the change in the texture of the paper aroused the curiosity of the passenger.

A wider use for transfers in securing better feeling from the public are items like the following printed on transfers by the Portland (Ore.) Railway, Light & Power Company:

"Move up a Little.—When you sit down in a seat please do not try to occupy more space than is necessary. Move up just a little and give the standing passengers a chance to rest. When the car is crowded do your part as a gentleman or a lady and kindly remember that one good turn deserves another. You may be standing next time.

"A pleasant smile and cheerful disposition smoothes the way for good service. The conductor appreciates courtesy. Benjamin Franklin once said, 'Kind Words are Paid for in Good Deeds.'

The company also printed on the back of its transfers references to certain rules to indicate the care which it takes of passengers unable to help themselves or otherwise irresponsible. One read as follows:

"Be Careful of the Little Ones.—Trainmen must not frighten children into jumping from the car when it is still in motion, even though they be in the act of stealing a ride. Slow down the car and put the little ones off with care and gentleness.

"Instructions to Trainmen.—Rule 1.—When old, infirm or crippled people board the train you must be very careful not to start until such persons have been seated or have reached some position where they will not fall when the train starts. Trainmen are requested to give the old and infirm every attention possible for their accommodation and convenience. To the old, mankind owes a debt of gratitude that nothing can repay."

Placards bearing appeals from charitable organizations are generally posted without charge by many railroads where the nature of their advertising contracts permits. The "Go-to-church" movement in 1914 obtained much help from electric railways in this manner. Some companies like the Brooklyn Rapid Transit System paid part of the cost of printing the car posters.

On Bundle Day, Feb. 25, 1915, the Louisville Railway ran two cars which stopped before certain schoolhouses to gather the bundles of clothing which had accumulated there to take them to certain carhouses for distribution among the poor. Its neighbor, the Lexington Utilities Company, which also makes ice, has given 1000 lb. a day of that product for distribution by the Salvation Army.

On the annual "Trolley Day" given for charity by the Urbana (Ill.) & Champaign Railway, Light & Gas Company all of the receipts are turned over to a hospital at Champaign. Young ladies from Champaign

and Urbana act as conductors during the morning. In the evening fraternity men from the University of Illinois, located between Champaign and Urbana, act as conductors, although the regular conductors of the company are on duty and in charge of the cars. The women in charge of the hospital usually combine "Tag Day" in connection with "Trolley Day." A like practice is in vogue on another property of the Illinois Traction System, the Jacksonville Railway & Light Company.

In October 1914, women were used as conductors for one day on the lines of the St. Joseph (Mo.) Railway, Light, Heat & Power Company. They were furnished by the Federation of Women's Clubs, which gave to the children's charities of St. Joseph any money in excess of regular receipts. It is not stated how many male victims received no change from the volunteer conductors. On this day, also, the company's park offered a special program.

Donation Day, just before Thanksgiving Day, is a Cleveland institution. On one of these days, \$14,074 was placed in the fare boxes for the Associated Charities. On the morning of that day the conductors pin carnations and strips of white ribbon bearing the words "Donation Day" upon their lapels. Posters are placed in the car windows asking for donations, and small placards are attached to the fare boxes with words of thanks to those who give. The crews on the various lines vie with each other in their efforts to secure the largest amount collected. The auditor's department secures an average of the receipts at this season of the year and derives the company's portion of the fund accordingly.

In recent years good work has been done to promote earlier shopping in the day and earlier inauguration of Christmas shopping. The Kansas City Railways displays in all its cars placards on which is printed in green ink, surrounded by a holly border, the following: "The company requests its patrons to join the nation-wide movement to make Christmas a happy day by shopping early in the season, early in the week, early in the day. By request of the Kansas City Consumers' League, shoppers should use homebound cars early in the day." A dashboard sign, used to advertise "Clean-up Week" in Denver, is illustrated in Fig. 99.

Toledo has a "Before Five Club." This humanitarian movement is gaining headway throughout the country. Electric railways may well encourage the "Shop Early" movement for it will keep shoppers from returning during the evening peak. The department stores can help by announcing bargain sales for the morning or early afternoon only.

The "Buy-at-home" movement is another form of civic work in which the local railway should join to the best of its ability. Thus the Portland (Ore.) Railway, Light & Power Company formed a club to encourage purchase of Portland- and Oregon-made goods. Its 3000 employees spend about \$1,500,000 a year. The club works along

sensible lines inasmuch as it asks all manufacturers interested to submit samples and prices for comparison and analysis.

The City Beautiful.—The erection of neat shelters and waiting rooms is but one way for a railway to show that it is not only in the town but of the town.

When new interests took over the Annapolis Short Line in 1912 they found that the vicinity of the station was hardly in consonance with the fine Colonial atmosphere of Annapolis. A number of tumble-down buildings not only obscured the view of the near-by Court of Appeals, but gave the approach to the station a most uninviting appearance. It was therefore decided that the rental from the shacks could well be dispensed with as a contribution to civic improvement. The structures



FIG. 99.—Dashboard sign used in Denver to advertise "Clean-up Week."

were torn down and replaced with turf and flowers to make a station approach now called "Short Line Park." This change not only cleared away several old unsightly buildings, but virtually placed the Short Line on one of the main streets of the city and within a block of the group of State buildings.

Along the Louisville & Eastern division of the Louisville & Interurban Railway are several suburban towns in which the "Community Beautiful" movement has been receiving attention. The town of Anchorage, for instance, engaged a landscape architect to make plans for it, while the people desired to see the railway replace its present station with something more to their liking. At O'Bannon's the station had been located for purely utilitarian purposes. When the landscape gardening fever came, the company was visited by a delegation of citizens who suggested that the station be faced differently. It was agreed that the commuters

were right, and a gang of men with jackscrews and rollers re-located the station in a way that met the idea of the landscape architects.

The building of floats for pageants is also a feature of civic participation, as at Los Angeles and Portland (Ore.) famed for floral fêtes. At the 1915 New York State Fair, the New York State Railways—Syracuse Lines—won a silver cup as a pageant prize. The prize winner, which was seen by some 60,000 people was a five-eighths size car float with all outer details covered with colored paper flowers.

Railway Personalities, Symbols and Slogans.—If a railway can identify itself with some popular fictitious character, the problem of public relations and advertising is greatly simplified. To the Eastern public Phoebe Snow in spotless linen typifies the Lackawanna Railroad. Among electric railways, Hi Jinks, the jovial patron of the Twin City Rapid Transit lines, is best known. Of course, the opinions or adventures of these characters should always be described in verse.

Many railways have adopted a typical symbol. The most notable, perhaps, is the "Liberty Bell" of the Lehigh Valley Transit Company. In general, the plan is to use a symbol that recalls some famous historical event; but, of course, historical events are not always found at hand. Others have made the adoption of a symbol a publicity affair by offering prizes for the best suggestions. In November, 1914, the Pacific Electric Railway even went so far as to offer a \$50 and \$25 prize for the best and second best name and symbol for its new personally conducted trolley trip through the fruit district.

Many railways use a slogan with or without a symbol. That of the Illinois Traction System—"Watch them work"—is out of the ordinary inasmuch as it calls attention to the safety automatic block signal protection rather than to the pleasure riding of the system.

Relations with the Press.—Some day a large number of electric railway managers will realize that newspapers are run to supply news of unusual events and that when reporters cannot get the facts they may draw upon their imaginations. For proof, observe how many of our fiction writers, now acknowledged as such, are graduates *summa cum laude* of daily newspapers!

Of course, the old excuses for secrecy were that details of accidents would be used to the company's disadvantage, that it was nobody's business anyway and that the internal affairs of a railway were of no news value.

As to the first allegation, an unfriendly and untrue account arouses in the minds of the future jurymen a prejudice that actual evidence cannot easily dispel.

As to the second allegation, a railway's business has become most emphatically everybody's business.

As to the third allegation, newspapers are the best judges of news values. The chance is that they will give a bigger spread about your fattest, leanest or oldest employee than about your change from 70-lb. to 100-lb. rail. Technical progress outside of cars means little to them unless it can be tied up with some interesting personality in the company.

The making of a newspaper is so much of a mystery to the layman that the railway manager is likely to get an awful shock when he meets the average reporter who is assigned to cover railway news. Judging from the tone of the editorials, he probably expected an intellectual colossus; he meets the cub of the staff, a boy fresh from school. But the railway man must learn to respect the reporter's office even if he cannot always respect the reporter. "A dog's obeyed in office," sayeth Shakespeare. He may only be a boy earning \$10 to \$15 a week, but his message is read by thousands to whom the printed word is the only source of information.

Every railway should make it a practice to receive the visits of local journalists at a stated hour at least once a week. If possible they should be received by an executive aided by a secretary who knows news when he sees it. The material may be given to reporters as prepared stories, if of financial or technical nature; otherwise the visitors will prefer hints which they can follow up by interviews with persons named, or perchance they may have some questions to ask of their own accord.

The procedure named cares for routine, but not for unforeseen matters, like collisions, fires, etc. To take care of such contingencies, the reporters should know that by telephoning a specified authorized official they can secure every fact needed to make a correct story.

To maintain cordial relations with the newspapermen one should know their trade ethics and ambitions. Reporters of rival newspapers often help out one another by exchanging news and then rewriting it, but this practice does not apply to anything that can be worked into a "scoop" or big exclusive story. To play fair with the boys, the railway will treat all alike so far as humdrum news is concerned, but if one of them uncovers a story alone it belongs to him exclusively.

From time to time it is possible to secure the publication of illustrated stories, to show the public more is needed to run a railway line than what can be seen on a car platform. Among suitable subjects for the Sunday papers are the dispatching system, the selection and instruction of employees, fighting snow, the lost article department, the emergency wagon, the printing, issuance, collection and accounting for tickets and transfers, the making and maintenance of timetables, the avoidance of accidents at grade crossings, etc. Some excellent work has also been done in describing the attractions of the lines such as unusual, beautiful or historic spots. For instance, one railway wrote up a fish hatchery and

another a college of historic interest with no other mention of the railway than the statement that the places were reached by trolley.

Newspaper advertising of public relations as distinguished from traffic publicity is a development of recent years. The Twin City Rapid Transit Company was perhaps the first to carry out a plan of advertising each department and the company as a whole in its relation to the community. Its method of advertising traffic delays and that followed by the New York State Railways—Rochester Lines—have been mentioned earlier in this chapter.

The Kansas City Railways, Kansas City, Mo., has also advertised in the daily papers of that city in a space 11 in. square a record of delays in service. One statement introducing the tabulation of interruptions to service follows:

"Reports of every delay in the street railway service are made to the headquarters at Grand Avenue and Fifteenth Street. Whenever a delay occurs the nearest division station is immediately notified and either a repair motor truck or car is at once ordered to the scene. Many of these delays are due to causes over which the company has no control. Last week two were due to parades, one tying up most of the downtown service from 10 to 40 min. Fires, wagons or automobiles breaking down on car tracks and freight train blockades are other instances. Where possible cars are routed around blockaded sections. In all cases the street railway company uses every means to overcome obstructions to regularity in service. A record of delays in service for five days of last week is given here in the belief that it will be of interest to the patrons of the company."

The Georgia Railway & Electric Light Company uses newspaper space weekly under the general caption of "The Window" through which the Atlanta public can look into the affairs of the corporation. These advertisements are prepared in a distinctive typographical manner, a drawing of a window being an appropriate feature. This company follows no regular schedule of subjects but writes about whatever traffic question is uppermost in the public mind.

The last word in putting the railway's case before its patrons is the use of moving pictures. In 1914 the Public Service Railway and the Edison Company brought out a film entitled "The Life of a Motorman" which, through the medium of a love story, introduced a great deal of good publicity about safe car operation. This film is of the type that should be circulated widely to give an inside view of the problems of the railway business.

Concentrated Publicity.—City-wide publicity campaigns of references to work done and money spent might well be supplemented by treating specific districts. For example, in one large city the local railway has equipped several of its routes with a new type of car which cost from \$7000 to \$8000 each. If the riders learned that every car was the equivalent in cost to a fine one-family suburban house, they would have a decidedly tangible idea of what the railway was doing for them. Again,

a substation is frequently an installation common only to a few lines. Here good publicity might be obtained by stating the cost of the outfit required to maintain good schedules and car lighting. In another instance, the sum of \$4000 had to be spent to replace a double-track branch-off at a certain corner after it had seen only five years of service. Here was an opportunity to blazon the fact that the railway would have to carry 80,000 passengers merely to pay for a single piece of special work at the intersection of two points. If news of this domestic character was made known by means of chatty car announcements to the passengers of the line affected, they would be likely to appreciate the cost of good service more directly than by references to the expenditures on the system as a whole.

Company Publications.—To supplement newspaper advertising for public relations and minor traffic notices, weekly or monthly bulletins are now issued by many of the larger railways. As a rule they do not carry advertisements or compete with existing newspapers for news even about the company's own affairs. They simply provide an opportunity for a heart-to-heart talk between the company and its customers. Their distribution to the riding public is easily accomplished through the medium of the company's own cars. Passengers have been known to pick up sheets for momentary diversion which later developed into a desire for serious home study.

Without doubt the regular publications of an electric railway bulletin can be often made a very useful bond between the public and the company. It can also largely overcome a hostile attitude on the part of the public, especially if it maintains an even, moderate tone in the face of all hostile criticism. It is harder for an electric railway to gain public esteem than for its opponents to load it with public disfavor. This handicap can be overcome only by absolute facts and persistent moderation in all details. Flippant phrases, baseless countercharges, bitter scoring of opponents—these are worse than useless—they are harmful to the company's interests. Nothing but a plain, unvarnished intimate statement of facts is effective, and if this policy is firmly adhered to, the public will gladly listen to the company's story.

A feature of "Trolley News" of the United Railways & Electric Company of Baltimore, Md., is the absence of all controversial matter, as the company believes that its policies can be explained to better advantage in newspaper interviews or advertisements. The folder always contains something pertinent about the service, such as the proper routes for reaching the markets during the Christmas and other holiday seasons, and it makes much about trips to the suburbs and parks and the use of special or chartered cars. When there is no appropriate picture to adorn the cover in honor of a holiday, sets of jingles and jests are in order.

In "Electric Railway Service" of the Detroit United Railway, the owl and interurban schedules are stock features. Much space is devoted to comparisons of Detroit's railway facilities with those of other cities, both American and foreign. This paper also publishes news of local entertainments, traffic hints for passengers and vehicle operators, runs pictures of the officers who are directly responsible for transportation, answers questions on railway matters, explains how and where complaints may be adjusted and prints letters from passengers received in praise of its car men and service.

On introducing its twice-a-month "Traction Bulletin," Feb. 25, 1914, the Northern Ohio Traction & Light Company said:

"This little paper is placed in the hands of the car riders of Akron and its environs for two purposes. One is to give information concerning the electric railway lines and their operation, and to discuss street-car problems in a frank and open way. The other has in view enlisting co-operation in the safety work systematically carried on by the company and its employees. These purposes, then, constitute the mission of the 'Traction Bulletin.' Its only promises are a strict fidelity to truth and a spirit of frankness and fairness, granting always to the utmost all that it asks for itself—a square deal."

PUBLIC ORDINANCES AND COMPANY REGULATIONS

As street railway cars are vehicles open to all and sundry classes of people some rules have to be laid down for the sake of the public welfare as regards cleanliness, habits that inconvenience other passengers, color, making change, etc. Some of these rules are made by the government and others by the railway; but no matter which is the author, the practical enforcement is left with the railway. In short the railway in the person of the poor conductor is the goat—not the State Board of Health or the (often) Common Council.

The following reviews the more common ordinances and regulations and the means used to enforce them.

Smoking Ordinances.—The advent of the fully inclosed car has removed the smoking nuisance in a large degree. Smoking in any but specified rear benches of open cars, walled sections of closed cars and special workmen's cars should be prohibited. The filth that smoking brings is not worth the few extra rides from short-ride smokers. Clean cars will get more business in the end.

Happily in late years rules as to smoking and its twin habit of spitting have been made by boards of health instead of the railways. Therefore, it is a good policy to emphasize the fact of "By Order Board of Health" and even to omit the railway's name entirely. In New York the Board of Health supplies the railways with 1.5-in. by 3-in. pads, the tickets on which are distributed by the conductor. The back gives the law against spitting, while the front reads as follows:

"You are violating the law against spitting. You are subject to imprisonment or fine or both. By order of the Board of Health."

A good deal of diplomacy is necessary to handle not only the man who persists in smoking but the far meaner individual who is saving his malodorous "butt" for re-use. If the conductor cannot enforce obedience to the law, he should be instructed to call for the first policeman available. The co-operation of the police is a necessity if the railway wants to avoid suits for ejectments. The Chicago and Philadelphia companies authorize conductors to eject offenders without waiting for police aid. Again the Public Service Railway, Newark, N. J., uses a request card to avoid personal discussion between the conductor and the passenger.

Similar cards have been issued elsewhere. They have proved quite effective because the passenger is at once disabused of the idea that the conductor is merely trying to bully him. The Newark card reads as follows:

"In deference to the wishes of the great majority of its patrons, this company has posted conspicuous notices calling attention to the rule prohibiting the carrying of lighted or partially consumed cigars, cigarettes or pipes on its cars.

"The very general observance of the rule confirms our belief that the regulation is a reasonable and popular one, and feeling that violations are due usually to thoughtlessness or perhaps ignorance of the rule itself, we take the liberty of calling the matter to your attention by means of this little card, in the hope that a better understanding of the situation will lead to your willingness to follow the general custom."

"PUBLIC SERVICE RAILWAY COMPANY."

Among other radical steps to do away with smoking is an order issued January, 1914, by the International Railway, Buffalo, N. Y., prohibiting smoking on all but a few interurbans cars. This step was taken in accordance with a suggestion from the Buffalo Commissioner of Health. This company has even considered the abolition of smoking compartments on interurban cars.

San Antonio, Tex., Butte, Mont., and Atchison, Kan., were among the communities which passed anti-smoking ordinances during 1914. At Atchison, the railway had found itself unable to enforce its own anti-smoking regulation. In Kansas City smoking was abolished by a public referendum instituted by the Metropolitan Street Railway.

In general, the movement against smoking on public vehicles is making good headway; but one backward step was the order issued in 1914 by the Public Service Commission of the First District, New York, forcing the Brooklyn Rapid Transit System to allow smoking on the four rear seats of its semi-convertible cars.

Spitting Ordinances.—The now-known relation between sputum and tuberculosis has led to many drastic ordinances against spitting. Bad habits deserve bad names. Let the warning cards be so plain that he who

spits may read and obey. It is not well to follow the wording of a California card which reads: "Passengers must not expectorate (Spit)." The brackets are in the original.

Since ejectments for spitting or other offenses always offer a possibility for law suits the plan devised in 1915 by the Louisville Railway and the Louisville & Interurban Railway in co-operation with the county health authorities may be worth imitation. The trainmen do not deal with spitters in their capacity as railway employees but as State officers with the title and powers of "sanitary inspectors." When a trainman finds a passenger violating the law against spitting, he fills out and presents to him a blank which ranks as a legal notice. This blank warns the violator that repetition will mean arrest. The trainmen are empowered and even charged to swear out warrants so providing.

Regulations Concerning Dogs.—Electric railways in providing for the comfort of the many must step sometimes on the toes of the few. Smoking and spitting are the worst sources of annoyance to fellow-passengers, but there are others.

Women are among these trouble-makers with anything from a Pomeranian to a brindle bull. They are as clever, too, in hiding dogs as Chinamen in smuggling opium.

Most companies will permit small dogs to be carried if kept in a special basket or on their owner's lap. Large dogs such as accompany hunters may ride on the cars of the Connecticut Company if chained to some part of the front platform and upon payment of regular passenger fare. The Detroit United Railways permits large dogs only on the rear platforms of city cars. Some companies relax these rules on the occasion of a dog show. For example, when the Long Island Kennel Courts gave an exhibition in 1912 the Coney Island & Brooklyn Railroad allowed dogs to be carried on the first three seats of certain cars before 10 a.m. one way and between 5 p.m. and 8 p.m. the other way. On interurban cars, dogs are usually carried in the baggage or smoking sections.

Regulations Concerning Odoriferous, Large or Dangerous Packages.—Although few railways object to the passenger with a bulky valise, a slide trombone or the like, they are justified in forbidding the carriage of poorly packed fish or other odorous substances. A regulation against fish is in force in several cities on those lines which carry people to and from the large markets.

The "didn't know it was loaded" idiot is a frequent passenger during the hunting season. Many railways therefore require that guns must be taken apart or at least unshelled in the presence of the conductor. A bulletin of the Detroit United Railway addressed to conductors on this topic reads as follows:

"Attention is called to the matter of firearms, particularly guns used for hunting purposes, carried by passengers. If at any time a passenger is examining a firearm, or handling it carelessly, or in such a way that it might imperil the lives of other passengers, caution him to desist and explain that this is a rule of the company for the protection of passengers. Also, so far as a conductor is able to do so, he must see that firearms carried by passengers are not loaded."

A good rule on transporting small animals or bringing bundles is that of the Springfield (Mass.) Street Railway. It reads as follows:

"Dogs, small animals and fowls must be carried by the passenger who has them in charge. Passengers are not allowed to carry bulky or dangerous packages aboard the cars and must not hang articles on the brake handles. Passengers are permitted to carry with them only such packages and bundles as do not exceed the size of an ordinary dress-suit case. Commodities of an oily or liquid nature placed in open receptacles will not be permitted aboard the cars. Such material must be in a tightly closed package, and otherwise wrapped to avoid contact with the clothing of passengers or staining of the cars."

The Public Service Commission, First District, New York, prohibits subway and elevated passengers from bringing in during the rush hours any package that cannot be conveniently carried on the lap. Special permits must be secured for bass drums and similar bulky articles.

Segregation of Passengers.—The present "Jim Crow" laws of Southern States are not costly to obey, as the division for each class of passengers is made merely by moving seat signs (marked "white" on one side, "colored" on the other) backward and forward as the ratio of the races may require. Separate cars are not demanded, the general rule being that the white passengers shall seek seats nearest the front and the colored passengers seats nearest the rear of the car. Some companies, as at Birmingham, Ala., use side-entrance cars, the front section for whites and the rear section for colored.

When southern companies use one-man cars the public must be educated to permit colored passengers to pass them on the way to the rear of the car. They are so used at Charlottesville, Va.

In the north protest is made occasionally against sitting with workmen who are in dirt- or odor-catching jobs. Where conditions justify it, special cars are run direct from the mines or the factories of the workers, the cars being thoroughly fumigated and cleansed after each trip.

CHAPTER XI

PROMOTION OF PASSENGER TRAFFIC

The present chapter will deal with methods of promoting passenger traffic, opening with the sources of pleasure travel and concluding with the sources of extra business travel. On many railways such outside business has been developed to the point of employing a pleasure traffic manager with a staff of solicitors. Pleasure travel is an especially important item on northern cross-country or seashore lines where it may be 33 to 50 per cent. of the total business.

Parks.—It was once a standing annual job of the American Electric Railway Association to secure a symposium on the park situation. Some companies would report that the park made money, others that it lost money, while the rest very candidly confessed they did not know. The last class apparently had a wholesome fear of what the auditor might show them if he made an analysis of the true cost of the park business, overhead charges included.

Electric railway men to-day are less sanguine about the value of parks. Granted certain conditions, however, one may predict whether the park stands a fair chance to make money. These conditions follow:

Conditions that Make for Park as Revenue Producer.—The park, except for a loop or siding to store cars should be on a line that is used every day in the year. Otherwise, with fixed charges at 6 per cent. per annum for investment, the railway must earn 24 per cent. on that part of the track and park equipment used for a three months' season.

The ideal park of the city and suburban railway will be within the 5-ct. zone of towns at each end of the line. In practice, however, it is commonly in the outskirts of one town or another. As every park visitor will travel to the end of the line, the average length of ride is very high. If this ride cannot be given for 5 cts., the park had better be forgotten. It is useless to expect much park traffic from family parties of women and children at 10 cts. per person, yet this is most desirable patronage, because it keeps the cars busy during the day and leaves them available for the morning and evening business peaks. One way to attract this class of travel is to give the children a free ride early in the season. If the youngsters like the park they will prove to be persistent press agents for the rest of the season.

The park should not be run in opposition to the local theaters. If

the local man thinks he could do better in the open-air surroundings at the park, let him put up the cash for a building and share the income with the railway. The railway manager should beware of attempting to manage a theatrical enterprise at the park. This can properly be left to the man who makes a business of it. The railway manager may think that it is a simple undertaking, but the chances are that he knows just as little about theatricals through seeing them as the theater manager does about electric railways through riding on them.

The park should not be run as a cheap imitation of Coney Island—cheap as an imitation but very, very costly to the railway. The “startlers” startle only once, and next year a new and costlier bag of tricks is demanded.



FIG. 100.—View in typical electric railway park. This park is in New Hampshire.

The park, before all else, should be a natural playground, with water if possible. It should be the place of places where the children can romp in safety, free from the terrors of the truck and automobile. If necessary, a matron service might be used to bring the children to and from the park if their relatives are unable to do so. A baby is “Pleased with a rattle, tickled with a straw.” Inexpensive swings, wading pools, slides, hammocks, rockers, toys and sand piles and the ever-popular merry-go-round will keep amused children of any age. The kiddies may be very happy in the street with little more than their natural high spirits to keep them amused.

The grounds that are so attractive to the children on weekdays can be used to equal advantage in the evening and on holidays to bring the folks of courtship age and beyond. A good dance hall with little or no charge

for dancing, tennis courts, baseball grounds, a bowling alley and moving pictures, perhaps, form permanent, not temporary, magnets. Under no circumstances should liquor be sold.

The cost of the music was formerly quite a burden for the small park. In view of the high development of automatic playing instruments, however, a phonograph, an orchestrion or a self-playing piano with banjo attachments, etc., will be found much cheaper than human players for the mechanical perfection demanded in presenting popular dance music.

To conclude, when a railway runs a natural park within a reasonable fare limit in a way to attract the best elements of the population, it will make money while earning a warm spot in the hearts of the public.

There are many other twists and turns to the park problem. The preceding paragraphs, however, are a distillate of the experiences of hundreds of companies. As such, their warnings and suggestions are not to be ignored by those who may be considering this supplement to the transportation business.

Bringing Business to the Park.—Of course, the best of parks will not attract business without some urging. Aside from publicity through print, the proper traffic official should be ordered to keep in touch with every social organization within reach of the company's lines. He should learn just what date each body selects for its annual outing and lay plans accordingly to book the business.

In the case of suburban or interurban lines it is customary to make a special rate. Often the organization pays so much per car or per person, receiving a commission from the railway on the total. In some instances the round-trip ticket is combined with coupons for luncheon and special attractions. While special cars generally are furnished to large parties, the tickets themselves are often valid on the outgoing cars at least, so that in the case of weekday parties a busy father may join his family later in the day.

For getting business from individuals the Aurora, Elgin & Chicago Railway in 1912 used the newspaper coupon scheme to offer reduced rates for the encouragement of weekday excursions.

Baseball Parks.—In the past a few companies have ventured to add to their burdens the ownership of a professional baseball team. Surely a railway has to meet enough complaints at best without entering a business where the chance of winning the pennant is only one in eight! It should be clearly understood that few minor leagues make money, the teams often being maintained for no better reason than that they advertise the town. An electric railway might go so far as to own grounds which are most favorably placed from a traffic standpoint. These grounds, however, should be leased to others. An occasional subsidy may not be out of place, but to be the owner is almost as bad as to be the umpire.

The manager will not suffer in dignity, by the way, if he follow the fortunes of the local team to see where it stands in the race, when it is in town, who its opponent is for the day and whether one or two games are to be played. This would seem needless advice if it were not a fact that accommodations for the baseball fan have been overlooked on at least one large system where the management ought to know better.

The All-year Park.—Not enough attention has been given toward making the park, and for that matter other outing travel, an all-year proposition. Summer, to be sure, is always bound to be the most popular, but why not encourage more acquaintance with the buds of spring, the golden leaves of autumn and the bejeweled trees of winter? If the patron is assured of a warm ride to a place where he will find cozy quarters, he will forsake indoors oftener than he does.

By the suitable construction of park dance halls they can be made more attractive than many of the places available in the city, and at least one place in this country, Riverton Park at Portland, Me., has set such a standard in restaurant service that the dining rooms are kept open all the year round to cater to banquet parties.

Parks with Residential Features.—Some parks are of such size and so favorably located that they may be used to build up a commuter's cottage or camp colony. For example, the Schenectady Railway's park on Ballston Lake, 8 miles from Schenectady, is laid out as a residential park. The company charges \$25 for each year on a ten-year lease of a lot 100 by 150 ft. Several hundred people live at Ballston Lake for several months in the year, and ride back and forth daily. In addition there is a large week-end travel of visitors to the Lake.

A commuter's colony has also been developed by the Albany Southern Railroad in connection with Electric Park, 18 miles south of Albany. This company not only leases but sells land outright.

The summer colony in Sacandaga Park, in the foothills of the Adirondack Mountains, is an even more elaborate example of parks of this kind. Many people come here from hundreds of miles away just as they would go to any other high-class resort. This park is operated by the Fonda, (N. Y.) Johnstown & Gloversville R. R.

Theater Travel.—Theater travel is a class of business which can generally be increased by adequate service properly advertised. The theatrical men will be glad to advertise the service in their programs (and even on posters, as is done in co-operation with the Detroit United Railway), and they will also give the railway the exact closing time of the show so that the cars can reach the theater at the right time; if a siding can be provided alongside or behind the theater so much the better. In some cities it may even be found feasible to run properly marked cars direct to the structure. Thus on opera nights the Boston Elevated

Railway has run special cars marked "Boston Opera House" to that building.

Interurban railways usually can take good care of theater business within say a 30-mile or 1-hr. zone. Proper co-operation with theater people and advertising should make the last night run more profitable than it usually is. Why should not the traffic manager undertake to reserve seats for out-of-town passengers, when the profit on transportation and the service performed will prove a mutually satisfactory transaction?

General Pleasure Riding.—A feature of electric railroads is that people often use them for no other purpose than the pleasure of riding through meadows, hills and woodland or along the shore of ocean or river. An experienced railway manager has said that the first essentials of success in developing pleasure travel are a good roadbed and fairly good rolling stock. Next in importance is some objective point. This need not necessarily be an amusement park. If the company will carefully develop pieces of woodland, a lake, a beautiful river scene, or some other place with natural attractions, and then will still more carefully and painstakingly advertise such places, traffic will often result which comes at a time of the day when it can be carried on regular cars without calling for extras. Not the least important item toward promoting pleasure travel is a timetable which is simple enough to be understood by the stranger. One of the best is that of the Atlantic Shore Railway, Maine, which shows all cars separately under the name of each town. To be sure this involves a great deal of repetition, but the convenience of the passenger is served and that is the main thing after all.

Every manager should look up the historical associations of his territory to see if it has anything worthy of special mention. For instance, the Lehigh Valley Transit Company was operated for several years before it exploited the fact that the route of the company between Philadelphia and Allentown was the same as that of the Liberty Bell when that famous relic was removed for safety to an Allentown church by Revolutionary patriots, preceding the British occupation of Philadelphia. Now the "Liberty Bell Route" with a print of the famous bell has become a most valuable symbol, particularly for use with historical folders.

Personally conducted trips with historical talks on the train are a feature of travel on the Liberty Bell Route. School teachers are offered complimentary trips, and in this way they are encouraged to make up excursion parties from their classes.

The Boston companies have a similar feature in advertising the route taken by Paul Revere; in the central and western states some trail of the pioneers, like the Illini, is featured; while several southern railways, as at Richmond, call attention to the famous battlefields of the Civil

War. These trips are not really of sightseeing character as the chief pleasure is in the beauties of nature, but they do make travel more than an aimless ride.

It is not absolutely essential that the railway itself must be used to reach the desired spot. Thus, the Valley Forge excursions of the Philadelphia & Western Railway are made on a combination ticket which includes an automobile round trip between the railway station at Strafford and Valley Forge.

In a few instances it would appear that railways have tried to place some attraction on the car itself. Thus, in 1912, moving pictures were placed on chartered cars by the Pittsburgh, Harmony, Butler & New Castle Railway as a part of the service. About the same time the Illinois Traction System installed a phonograph in one of its parlor cars to determine whether the addition of music would make these cars more popular on long journeys. Passengers were requested to dictate their opinions of the innovation into a dictaphone installed on the car. As for their use in regular passenger service, the moving picture and phonograph are no longer novelties and it is unlikely that they would long remain in favor. The pictures would prevent passengers from reading, while the records could hardly please all, even if the passengers were disposed to listen to them.

We have already referred briefly to winter pleasure travel in discussing parks. It is worth repeating that riding for pleasure need not end with Labor Day. Autumn days are often the most delightful of the year. Those who are not content to shut themselves up until the period of snow sports will be glad to hear that good railway service is available for nutting parties, husking bees and moonlight trips. Ice skating is an old stand-by, but snowshoeing, ice yachting and skiing tournaments are still in their infancy as traffic producers. A little quick wit may often produce quite a jump in traffic as it did in the year 1911, when the Kentucky & Southern Indiana Traction Company and the Louisville & Northern Indiana Railway made a special feature of advertising that the Ohio River was full of picturesque floating ice. This attraction and the cost of getting to it by trolley were advertised in the newspapers with excellent results.

Sightseeing Travel.—Sightseeing travel is not so common in American cities as it is abroad because of the absence of historical places, remarkable buildings of past ages, art museums and the like. For all that it is doubtful whether American electric railways take advantage of the sightseeing business that is available.

There are few places in America with the charms of Quebec or New Orleans, but there are many which for one reason or another do entertain many strangers whether from day to day or on the occasion of con-

ventions, fairs, etc. The campaign may be carried out in co-operation with convention and tourist bureaus, as at Detroit, where 200,000 visitors have been entertained in one year. If there is enough permanent sightseeing business it can be secured largely for transportation in a special car at a special rate—say 25 to 50 cts. for a complete trip with guide.

Wichita, Kan., at first thought does not suggest a promising place for sightseeing travel, yet on the occasion of a dry-farming congress in 1914, the Wichita Railroad & Light Company ran a "Seeing Wichita" car twice a day at 25 cts. per trip. Furthermore, every employee was decorated with an "Ask Me" badge to encourage the diffident visitor to seek help. Thus the company not only gained some extra revenue but performed a service that was a great convenience to the stranger. Furthermore, the idea of offering every platform man as a guide showed the kind of spirit that also makes the local public feel that its railway system is seeking to make the town a byword for hospitality.

That sightseeing travel does not come of itself even under the most favorable conditions is well illustrated in the experience of Quebec. Although this city with its large French element and wonderful location has always been a most attractive place to tourists, the railway did not realize until 1912 that it had not been catering to the much larger number of people who would be glad to visit the town if they could see the notable places in a few hours at a nominal expense. Most of the tourists had been people who could afford to stop at the hotels for a week or more and go to each place leisurely in carriages in preference to the street railway. Nowadays, the observation-car service is so well advertised that thousands of people who would not have visited the city under former conditions come to Quebec by boat in the morning, take in the town by trolley and leave by boat in the evening.

In 1912 the company issued its first trolley-trip guide on the attractions of Quebec. This booklet described the many historical places of the city in a pleasing style. The photographs were made cheaply with a kodak of postcard size. Of this edition of the guide, 40,000 copies were printed and distributed among tourist agencies, steamship lines and other organizations in touch with travelers. It was found that the guide increased the general traffic but did not help the business of the sightseeing cars because it had been made out to cover individual trips, each of which would cost but 10 cts. per round trip. In 1913, when an edition of 50,000 copies was printed, 50,000 dodgers were also included. The latter, which were handed to tourists when they arrived at Quebec, advertised the observation car as the one way to see the city. The result was an increase of almost 100 per cent. in the observation car business. A convenient feature of the guide is that the text is arranged to follow the route of the observation car so that "he who rides may read" to the best

advantage. The edition of the guide for 1914 numbered 100,000 copies. It contains industrial data to exploit the merits of Quebec as a manufacturing and distributing center. An alphabetical list of all products manufactured in the city is presented so that outsiders will know what Quebec lacks as well as what it has.

The first observation car was installed in 1910 and the second in 1911. The cars are of the open-tier type, similar to those used for the same travel in Montreal and Vancouver, see Fig. 101.

As each pair of seats is one step above those immediately ahead, everyone has a good view and may take snapshots from almost any position. The car is not roofed, but several light brass arches are attached to carry lamps for night service. Each car seats forty-two with a maximum of fifty when camp stools are placed in the aisle. With one of these



FIG. 101.—Observation car for sight-seeing tourists, Vancouver, B. C.

cars a person can see the principal parts of the city in 1 hr. and 45 min. for the nominal price of 50 cts. and have a competent guide explain everything of interest along the route.

The same company also operates an interurban line to the shrine of St. Anne de Beaupré. A large portion of this business is conducted in trains known as "tourists' specials." These do not make any intermediate stops except one at Montmorency Falls where the company also has a park and menagerie. The feature of general interest is that these trains are in charge of a guide who explains the history of the towns and the interesting geographical features seen from the car. Furthermore, at St. Anne itself, the visitors are conducted by one of the Fathers under special arrangement made by the railway.

It may be added here that special sightseeing cars should always be built open at the top so that the riders may see to better advantage

and take snapshots as they pass some interesting point. It is annoying to embark on a trip in a "sightseeing" car and then get for 25 or 50 cts. no better views or guide service than from a 5-ct. trip.

Promotion of Business Travel.—Far more important than the development of pleasure travel is the creation of business traffic. The pleasure passenger rides but once or twice a week for three or four months in the year; the business passenger rides almost every day in the year. But the business passenger is often taken as such a matter of course that the possibilities of stimulating such traffic are often overlooked. This is a mistake. Everyone, to be sure, must do some riding, but the "must" riding is the only kind inadequate or indifferent service can fetch. Is it not worth while to induce $\frac{1}{2}$ - to 1-mile walkers to ride morning, noon and night; to induce the 5-ct. rider to become a 10-, 15- or 20-ct. rider and to induce the village resident to make at least one trip a week to the local cosmopolis?

Stimulating City Riding.—The amount of city riding is influenced by many factors as noted in the chapter on "Fares." But this does not mean that the riding habit cannot be accelerated by both open and covert means.

Without question the fundamental attractions in city service are comfortable cars and exact schedules. City companies are gradually learning to appreciate, for example, that while a cross-seat car may hold fewer people in the two or three rush hours it earns more per mile in normal hours and therefore more per diem. In New York, the Third Avenue System found, on superseding longitudinal seat cars with cross-seat cars, that the receipts rose from 32 and 34 to 36 and 38 cts. per car-mile because the public soon learned that a greater number of seats and more comfortable seats were available.

How little the manager even of a small city railway may know about traffic possibilities is illustrated by the following case. When the jitneys first entered this town, it was apparent that the best chance they had for making money was on market days when the women of the city and nearby suburbs came in to do their heavy purchasing. Merely as a war measure, the company greatly increased its service on these days. Much to its surprise and gratification, the earnings per car-mile and car-hour actually increased. The jitneys have now disappeared from the city, but the increased service has been retained. Surely, a case like this emphasizes the need of periodical traffic analysis, regardless of assumed familiarity with all conditions.

In the small city more than "must" traffic will come only if the cars are kept to an absolute schedule and operated at shorter intervals than 15 or 20 min. Obviously one-man cars will have to be used far more extensively than in the past.

More subtle ways to catch the small-town rider are also available. As instances, the Union Street Railway, New Bedford, Mass., has stimulated traffic by flooding the big stores with nickels so that the Saturday shoppers will feel more inclined to use the cars. This looks like a feeble stimulant, but when we consider that New Bedford is a town of mill hands, the company's plan will be better appreciated. Another company (Sheboygan) in 1907 printed a number of strip tickets slightly different in color from the regular supply, and these off-color strips were "lost" in different portions of the city. The purpose of the off-color, of course, was to identify the "deadheads" as they came to the auditor. It was declared that four times out of five, a finder of one of these strips became an habitual rider. This was particularly true among the workingmen.

The Sheboygan company also issued shopping tickets for a time, good only between the hours of 9 a.m. and 4 p.m. A few women protested about limiting these tickets to hours not later than 4 p.m., but the result was very satisfactory. These tickets appealed to the natural bargain instinct of the women as they were sold seven for 25 cts. and they were placed on sale in all the stores. These tickets were furnished to the merchants at 21 cts. per strip, or 3 cts. per ticket, who thereby made 4 cts. or approximately 20 per cent. on every strip sold. To get the saving in price the women began the return trip before 4 p.m., thus lessening the load at the peak hours. These tickets were kept in use for a year and a half or until after it became apparent that no greater volume of shopping business could be secured. The shopping passengers thereafter traveled on tickets sold six for 25 cts., but they had acquired the habit of returning before 4 p.m. The practice just mentioned is quoted not as a model for present days but as an example of what has been done. To issue tickets at these low rates, even temporarily and to encourage off-peak travel, is playing with fire. We believe that it would be more to the purpose to advertise that "shoppers' specials" would be available at 4 to 4.30 p.m. from the big stores.

Promotion of Commuter Travel.—We have already noted in the case of the Schenectady Railway an example of commuter travel development as applied to a park colony. While such examples are very rare, opportunities to promote residence in and consequently travel to suburban communities outside the railway ownership are to be found almost everywhere.

With the straight or depreciated 5-ct. fare in vogue, we can hardly expect city railways to display a violent enthusiasm for the culture of the genus commuter. In fact, many an urban company now bewails the day when the blandishments, cajolery or threats of the "realestate-nickers," as the New York East Sider calls them, led them to strike into regions inhabited by little else than bullfrogs and ozone.

Contrariwise, the suburban or interurban railways operating on the zone system will find it desirable to create as much commuter travel as possible—always provided that they do not offer to carry every passenger for $\frac{1}{4}$ ct. per mile or thereabout. Such rates have proved hurtful even to steam railroads although the latter were re-imbursed in part by the development of freight traffic.

In general, American electric railways have not developed any such definite plans in this field of traffic creation as has, for example, the London Underground Railway System. This company appreciates that the possible commuter wants to know something more than the distance, time and fare relating to each suburb. Its maps, therefore, show in circles over each town such important items as tax rates, gas rates, electric rates, water rates and the like. The same maps also show the topography, while additional data are printed covering schools, churches and other communal centers.

It might be urged that a campaign of London style really should be conducted by the realty companies themselves; but in view of the contradictory braggings of the latter, the intending commuter would rather depend on the comparative statistics presented by the railway, which has no strong reasons to favor any one town above others on its lines.

The Topeka (Kan.) Railway co-operates with real estate concerns by utilizing its advertising space to urge residents to locate as far out as possible. The company's advertising explains the advantages of low taxes, better air and more room available in the suburbs. It concludes by asserting that the suburbs are as accessible as homes in the central part of the city because of the rapid and reliable street railway service.

The Albany Southern Railroad has also paid special attention to the development of commuter traffic. It solicits information regarding property for sale or rent, summer hotels, camps and boarding houses along its line, and furnishes this information to anyone interested in country life. The company also attracts residents for the towns reached by its railway by erecting large sign boards near the station at each town where they can be read by passengers sitting in the cars which stop at the station. These signs give the name of the town, the running time and the round trip commutation fare to Albany.

So far as summer resort travel is concerned, every railway should at least make it a point to issue a rate list of the boarding houses and hotels along the line.

Of course, various forms of co-operation with realty interests are in vogue on some of our railways. The construction of handsome stations and shelters is a very common way of helping the sale of lots in the vicinity. But we believe that since the realty company's profit comes at once

while the railway's is in the nebulous future, the cost of the station ought to be donated by the former.

Booster Work.—A typically American style of co-operation with the business elements of the community is to join the booster clubs, to wit, the civic organizations which are organized to bring industries and people to the town on various favorable bases. The booster sentiment is quite recent. The smaller towns are especially aggressive as they have cheaper land, lower rent and taxes, etc., than the large cities. Often the promise of a siding to the steam railroad will bring a large industry with hundreds of employees who will each ride at least 300 times a year. On the Pacific Coast such schemes are carried out on a practically steam railroad scale, including extended residential territory either within or without the town.

A more sporadic form of boosting lies in inducing fraternal, professional or political organizations to hold their conventions in the boosters' town. The extra travel due to the convention usually is not a good enough inducement to pay for the free hall and other concessions for securing the convention, but it is always the fond hope of the booster that acquaintanceship with his town will eventually change some of the transients into permanents. Occasionally a really big convention does repay the outlay, as when the Metropolitan Street Railway, Kansas City, Mo., contributed \$1000 and got back \$20,000 in extra receipts from about 8000 visitors and their friends. Usually, however, such contributions are but good-will offerings to gratify civic vanity in advertising the old home town.

Bringing Buyers to the Local Big Town.—A number of railways have made it a point to stimulate travel by entering into plans whereby the merchants in the large towns refund all or part of the railroad fares to purchasers. Before making such a deal, however, the manager should satisfy himself that he is not antagonizing important business elements in the small towns; and also whether the state laws permit him to enter into such fare-reduction schemes.

One successful example of this practice is afforded by Kansas City's Suburban Day inaugurated June 10, 1914. Here the merchants and interurban railroads co-operate to attract residents of neighboring towns to Kansas City. Every Wednesday is now suburban day. On the first day set apart for suburban trade, most of the electric roads running into Kansas City operated extra cars for the benefit of the out-of-town patrons. The Missouri & Kansas Interurban Railway went a step further and distributed 500 free tickets to women along its route. Free tickets are now unnecessary, however, as the Kansas City Merchants' Association refunds transportation to all visiting patrons who purchase a certain amount of goods. The posters distributed along the routes of the interurban railway to further the project bore illustrations of cars taking shop-

pers into the city, buyers on the streets and in the stores and the general activity of a metropolis. A similar scheme has been carried out by "The Associated Retail Stores of St. Louis" which numbers about sixty stores. Independently of the railway this organization refunds the fare of all who purchase more than a certain amount and live within 20 miles of St. Louis on lines of the Illinois Traction System.

Another example of enterprise in this field was the case of the Tri-City Railway which actually turned the tables in favor of the smaller town. This road serves both Clinton and Davenport, Iowa. As Clinton is only 138 miles from Chicago, the railway in 1908 was compelled to find a way of inducing Clinton people to trade in Davenport rather than Chicago. To accomplish this result, it persuaded a number of Davenport merchants to carry a larger and a more varied stock of merchandise, thereby attracting a larger number of Clintonians.

Allied to the foregoing plans, in spirit if not in purpose, is the rapprochement of big-town wholesalers and small-town retailers. For example, in 1911, the Detroit United Railway ran special cars to forty different communities in co-operation with the Wholesalers & Manufacturers' Association of Detroit, for the purpose of meeting the customers of the Detroit business houses. These trips were arranged for the members of the trades promotion committee of the association. Ten very successful trips were conducted with two to four cars for each trip. The different firms were represented by at least one of the proprietors, and it was understood that no business was to be solicited and no bills were to be collected. Trips of this character have also been made out of Indianapolis to merchants in towns along the Terre Haute, Indianapolis & Eastern and Indianapolis, Crawfordsville & Western Railways.

Libraries as Travel Promoters.—Still another means of increasing travel is revealed by the following report of the librarian at Dallas, Tex., made in 1914:

"When the rules for the government of the library were made in 1901, the distance limit set for borrowers was $3\frac{1}{2}$ miles from the post-office. Later this was changed to a radius of 10 miles from the post-office. During the past year we have had several persons ask for further extension, giving as a reason that they had moved out on the interurban beyond the 10-mile limit, though still doing business in Dallas. In the reference department, Saturday morning during the school term seldom fails to bring students from the surrounding towns, anywhere within a 70-mile radius, for debate and other reference work."

This report suggests that advertising the topical books of the local library would bring many an extra ride.

House-to-House Canvas.—Although most electric railway companies have not conducted a house-to-house canvas in the same manner as is common with electric lighting companies, occasionally this plan has been

followed by railways in small towns. An example is the City, Light & Traction Company of Sedalia, Mo., one of the Doherty properties. The canvas was made supplementary to a newspaper advertising campaign for more business and better public relations and was conducted during the spring of 1916.

The man employed for this work was an "extra" man of the transportation department, at 20 cts. per hour, and of pleasing personality. On his first visit this canvasser left a blotter on which was printed a timetable of the various lines of the company. On his second visit he left another small souvenir advertisement.

During this canvass he endeavored to find out any complaints that the street car patrons might have, and made a special point of emphasizing to them how with a single-track system and railroad crossings the cars could not always be on time. Along this line he explained the efforts of the company to give good service and keep the cars on time, and showed specifically the problems with which the company had to contend. This work was all done in the day time, inasmuch as the company believed that the lady of the house was really the one first to approach.

After straightening out any complaints found and making note of any suggestions offered, the canvasser explained the desirability of purchasing the street car tickets. If there were children in the home, he told of the half-fare tickets. He emphasized the percentage saving in the purchase of tickets, and made a special effort among the laboring classes to have them lay aside a certain amount each pay day so as to purchase enough tickets to last from one pay day to the next.

The company was well pleased with the results of the campaign from the standpoints of both improved public relations. As the canvasser was a practical railway man he was able to explain many things which the public should know about but of which they had not thought. Increased patronage of the cars was also experienced.

Long-distance and Interline Travel.—The serious effect of the automobile, on short riding, demands that greater attention be paid to the development of traffic over long runs, especially interline riding by means of a through car. Long-run service has attained large dimensions within recent years, but such business is not near a maximum even in the highly developed interurban districts of the Central States with most of the track on right-of-way. This is not due so much to lack of physical connections or different equipment standards, as to the delays incident to running the same train partly as a local and partly as an express or limited, to passing over intervening tracks, to taking on pilot crews, etc. The long-run interurban cars need not be as fast as the steam trains, but there is no reason why their passengers should have to become acquainted

with the beauties of every Main Street in the towns through which they pass.

The problem of handling long-distance travel over interurban lines can best be appreciated by following the development of conditions at Indianapolis, the greatest interurban center of the Central States. On July 1, 1905, the Indianapolis Joint Ticket Office was opened, with one agent and one ticket seller. At this time the issues consisted of only a few local card tickets and no fare sheets for connecting lines, so that the agency was unable to sell through tickets. The sales of interline tickets was begun in 1906 and soon reached large proportions. The sale of through tickets was followed by the introduction of through trains. By February, 1914, this business had attained such scope that through limited trains were operated between Indianapolis and the cities mentioned below. The miles and times given relate to the distance and running time from Indianapolis. Thirteen routes are now operated from this great terminal.

	Miles	Time	No. trains daily each way
Ft. Wayne, Ind.....	136	4 hr. 55 min.	10
Goshen, Ind.....	160	2 hr. 27 min.	2
Louisville, Ky.....	117	4 hr.	6
Terre Haute, Ind.....	72	2 hr. 25 min.	7
Marion, Ind.....	72	2 hr. 40 min.	2
Lafayette, Ind.	70	2 hr. 10 min.	5
Richmond, Ind.....	70	2 hr. 35 min.	7
Muncie, Ind.....	57	1 hr. 50 min.	10
Connersville, Ind.....	58	1 hr. 55 min.	4
Greensburg, Ind.....	49	1 hr. 45 min.	6

To contrast the Indianapolis showing with the accomplishments in the East is almost a jest. Nevertheless, some roads have accomplished notable results in spite of heavy physical difficulties. The Lehigh Valley Transit Company, in particular, has made the trip between Allentown and Philadelphia very popular by a connecting service with the Philadelphia & Western Railway via Norristown. However, many improvements in curve and acquirements of right-of-way had to be made before it was possible to give a satisfactory high-speed service. A number of New England and Central New York lines also have interline arrangements.

One of the latest interline agreements covers excursions by trolley and boat to Niagara Falls. In 1915 the Fort Wayne & Northern Indiana Traction Company, Fort Wayne, Ind., adopted a joint passenger tariff in connection with the Ohio Electric Railway, the Detroit & Cleve-

land Navigation Company, the Cleveland & Buffalo Transit Company and the International Railway, Buffalo, naming excursion rates from various points on the Fort Wayne & Northern Indiana Traction Company's line to Niagara Falls, N. Y., and return. The Union Traction Company of Indiana is also concurring in the excursion, routing people from Indianapolis and points on its line in connection with the Fort Wayne & Northern Indiana Traction Company to Fort Wayne and turning them over to the Ohio Electric Railway. The full excursion fare to Niagara Falls from La Fayette, the most westerly point on the line of the Fort Wayne & Northern Indiana Traction Company's line, is \$10. This, of course, does not include meals, berths or staterooms. The route from La Fayette is via Logansport, Peru, Fort Wayne and Lima to Toledo, and thence by boat across Lake Erie.

Securing the Business of the Commercial Traveler.—Many electric railways are practically unaware of the existence of the Travelers' Protective Association, an organization which in Pennsylvania alone had a membership of more than 22,000 in the year 1914. One manager of a Pennsylvania company has explained how he has kept as passengers the members in his territory even after he added a charge for excess baggage.

He keeps in constant touch with the State secretary of the Association, advising him of all changes of service and regulations that would be of interest to the members. When anything of unusual importance arises he requests that the secretary arrange to have a committee of members visit him for discussion. Thus, one source of occasional friction was complaint from commercial travelers about overcharge for fare or arguments with conductors concerning alleged over-riding. By agreement, the secretary now requests all members to retain the duplicate receipt in case of dispute, leaving him to adjust the case with the railway. The Association is very jealous about the reputation of its members, and it is understood that if any member is found guilty of cheating the railway by over-riding, he will be expelled.

This railway also arranges to route commercial men in the quickest and most economical way upon receipt of their itineraries.

Chartered Cars.—The chartered car appeals to the feelings of exclusiveness, sense of ownership and comfort beloved of most humans. There is really no good reason why club travel, particularly on inter-urban railways, should not be handled on chartered cars.

No definite universal rules are in vogue as to payment for this service. Some companies charge by the mile, some by a certain multiple of the fare (based on car capacity) and some on the time basis. The last is the best, for such cars often have a great deal of standby time and, in any event, the price should be commensurate with the regular earning powers of the car and the special service given. Payment for the service is better

secured in advance or on the car. It is a mistake to bill for the service, as even the most solid citizens of the town may need a lot of dunning, which results in mutual irritation.

In the earlier days of electric railroading, ornate parlor cars were available for chartered service at rates as fanciful as the car hangings. When the novelty of the "parlor" cars wore off they remained idle and useless most of the time. One of our acquaintance, however, has been converted into a pay car, so that it is still in high favor, with the employees at least. City chartered cars now differ in no particular from the regular rolling stock, except when made especially for observation purposes, and the fares have been lowered accordingly. As for interurban service, the average day coach is satisfactory where no chair or parlor cars are available.

As the least favorable field for the chartered car is in city service, special interest attaches to the practice of the Boston Elevated Railway which has developed this business to a notable degree. Thus the revenue in 1912, 1913, 1914 and 1915 has averaged \$20,000 to \$21,000 per annum.

The following tariff for special surface passenger cars went into effect on July 10, 1916.

BOSTON SPECIAL CAR RATES—SURFACE

Length of trip one way minutes	One way rates			Round trip rates		
	Limited to					
	40 passengers	75 passengers		40 passengers	75 passengers	
		Rush hours	Normal hours		Rush hours	Normal hours
		No. 1-A	No. 2-A		No. 3-A	No. 1-B	No. 2-B	No. 3-B
1 to 15	\$4.00	\$4.50	\$4.00	\$6.00	\$7.50	\$7.00
16 to 30	5.00	5.50	5.00	8.00	9.00	8.50
31 to 45	.....	6.00	5.50	.....	10.00	9.00
46 to 60	.....	6.50	6.00	.....	11.00	10.00
61 to 75	.....	7.00	6.50	.....	12.50	12.00
76 to 90	.....	8.00	7.50	.....	14.00	13.50
91 to 105	.....	9.00	8.50	.....	16.00	15.50

Rates apply to 25 ft. box or nine-bench open cars except when otherwise specified.

- (a) Length of trip will be the scheduled running time via shortest feasible route by existing tracks.
- (b) A round trip includes free lapsed time between two halves of trip.
- (c) Normal hour rates (3-A and 3-B) apply only to cars which are started and finished between 8 a.m. and 5 p.m., or between 7 p.m. and 12 midnight.
- (d) An additional charge of 20 per cent. will be made for twelve-bench open cars.
- (e) When large cars are chartered, the charge and limit of capacity will be prorated according to the seating capacity, using the 25-ft. as basis for closed cars, and the twelve-bench open car as basis for open cars.
- (f) An additional charge of 25 per cent. will be made for special parlor cars seating twenty (20) passengers.

(g) When cars are run between East Boston or Chelsea and points on Boston side of Ferry (connecting at ferry) the rate will be that determined from the running time between terminals and size of car used on Boston side, with \$1 added to cover additional expenses due to operation of two cars.

(A) Rate for a trolley trip will be \$7 for first 2 hr. or fraction thereof, and for time over 2 hr. \$1.50 for each half hour or fraction thereof, based on schedule running time from time of starting to time of return to carhouse.

(i) A charge will be made for delay of over 10 min. after time set for starting or returning of 25 cts. for each quarter hour or fraction thereof.

(j) An additional charge of \$2 will be made for any half trip or round trip starting or finishing between 12 midnight and 5 a.m.

(k) If a chartered car is pulled out and not used a charge of \$1.50 shall be made for the first half hour or fraction thereof, and thereafter 50 cts. for each 15 min. or fraction thereof; provided, however, that a further charge of \$2 shall be made if any part of the trip proposed is between midnight and 5 a.m.

(l) A discount of 10 per cent. from established rates will be made to any party for whom 50 or more special cars are run within twelve months.

(m) Unless otherwise provided, 25-ft. box or 12-bench open special cars only will be chartered for operation over lines of other companies or accepted from other companies.

(n) A minimum charge of \$2 will be made for cars while off the lines of the Boston Elevated Railway, in addition to regular rate, and for each hour above four (4) hours, 50 cts. per hour or fraction thereof, will be added.

(o) Where a special car trip includes lay-overs at the request of the party chartering the car, an additional charge will be made over and above the scheduled rate based on the running time (excluding lay-over time) of fifty (50) cents for each half hour or fraction thereof, except that a party chartering a car for a round trip will be allowed one free lay-over.

(p) The disposal of cars during lay-over time at destination will be entirely in the power of the local superintendent and chartering parties have no rights to the car during that period.

BOSTON SPECIAL TRAIN RATES—ELEVATED RAILWAY OR IN CAMBRIDGE-DORCHESTER TUNNEL
Special trains will be furnished when conditions permit, upon application to the company, for prices given below.

(q) **Elevated System.**

Train service, approximately 100 passengers per car

	One way	Round trip
Four-car train, limited to 300 passengers.....	\$45.00	\$90.00
Passengers in excess of 300.....	0.15 each	0.25 each

(r) **Cambridge-Dorchester Tunnel.**

Train service, approximately 150 passengers per car

	One way	Round trip
Three-car train, limited to 300 passengers.....	\$45.00	\$90.00
Passengers in excess of 300.....	0.15 each	0.25 each

(s) The rate for two trains connecting at point where transfer must be made will be the same as when the entire journey is made on one train.

(t) Special trains cannot be run during rush hours.

The business is considered highly desirable as it affords an opportunity to utilize men and equipment when the regular service is not under maximum strain, thus enabling men at the foot of the extra list to get better wages. The men in charge of the chartered cars, however, should be the most experienced and polite in the service. Special efforts are made to have the cars make their runs with the least possible interference from congestion, etc., and arrangements exist to permit them to be switched over to other tracks.

Parlor-, Observation- and Chair-car Service.—The longer interurban roads of this country have established parlor and chair cars, some with buffet features, for many years past. These, of course, are generally attached to the limited trains.

The character of this service may be best understood by explaining the practice of such well-known lines as the Aurora, Elgin & Chicago Railway and the Illinois Traction System.

The Aurora, Elgin & Chicago Railway operates parlor buffet cars out of Chicago over a 40-mile route on trains spaced 3 hr. apart. The interior

fittings include tables, wicker chairs and equipment for serving high-grade meals to thirty passengers at one time. The service privileges are handled by the railway. An extra charge of 15 cts. is made to each passenger who rides on the parlor buffet cars.

The Illinois Traction System inaugurated an extensive parlor observation-car service in 1911, which by 1914 had expanded to seven cars. Parlor cars are attached to limited trains, but not all limited trains have parlor cars. Those with the parlor cars attached make two round trips a day between Peoria and St. Louis, 175 miles each way, one round trip between Springfield and St. Louis, 100 miles each way, and two round trips between Springfield and Danville, 127 miles each way. The Danville-Springfield service connects with the Peoria-Springfield service, so that through service is given to and from St. Louis. The schedule speeds of these trains, which consist of motor car and trailer, are about 25 m.p.h., including all stops and dead time at junctions.

The parlor cars are added to the limited trains which regularly carry heavy through business. Inducements are offered which have resulted in building up traffic that formerly made the long runs on the trains of parallel steam railroads.

The rates for seats in the parlor cars are approximately $\frac{1}{2}$ ct. per mile in addition to regular first-class fare. A minimum rate of 15 cts. is observed. All station agents sell tickets and make reservations in advance. The parlor-car-seat ticket consists of three sections, one of which is collected by the conductor, one by the porter while the third is retained by the passenger. A similar triplex ticket is used for this company's sleeping cars. The crew of the two-car trains with observation trailer consists of a motorman, a conductor and a parlor-car porter.

The Empire United Railways Inc. operates a parlor-car service between Rochester and Syracuse, a distance of 86 miles, with rebuilt private cars. A flat charge of 25 cts. extra is made regardless of the distance traveled. The parlor cars have not only brought an extra revenue of \$7500 per annum, but have also encouraged through travel in competition with the New York Central steam service.

In commenting upon parlor-car operation in general it may be said that primarily it indicates an effort to build up new traffic on an equal competitive basis with the steam railroad. The results in most cases have been encouraging if not always immediately productive of large increases in revenue. One of the principal operating objections to parlor cars has been the limited seating capacity. Those of the Illinois Traction System, for example, seat only thirty-five passengers whereas a standard coach of the same size will seat fifty-six passengers. However, this disadvantage is minimized when parlor cars are trailers and are hauled by a motor car, for then the cost of operating a two-car train is but little more than for a

single car. A porter for the parlor car at \$50 a month represents the only additional labor expense. For instance, the Illinois Traction System found that a two-car train consisting of a motor and trailer parlor car consumed only 650 kw.-hr. in 175 miles as compared with 504.5 kw.-hr. for one-motor car.

In 1915 the Waterloo, Cedar Falls & Northern Railway known as the Cedar Valley Road placed in service three all-steel parlor observation cars. These include a buffet service. The car is divided into a main passenger compartment and an observation compartment with observation platform, a built-in writing desk and a desk chair occupy one corner of the main compartment, patrons being furnished with envelopes and letter-paper bearing the company's trademark. A leather-upholstered davenport is located beside the partition between the two main compartments. Both compartments have leather-upholstered wicker chairs.

Sleeping Cars.—The Illinois Traction System has operated sleeping cars for more than nine years, and curiously enough they preceded its parlor observation cars by three years. The original Illinois cars were inferior in their accommodation compared with later types of sleeping cars, but their use demonstrated that sleeping-car service was a commercial possibility for an electric railway. After the first cars had been operated less than two years, four large sleeping cars with such novelties as berths 6 in. longer than Pullmans, safety deposit boxes for valuables with key for both passenger and porter, and windows in the upper berths, were built for service between St. Louis, Springfield and Peoria. Five cars are now in service. The distance from St. Louis north to Springfield is 100 miles and from there to Peoria is 75 miles. Trains are made up of a combination express-passenger motor car, a trailer coach and two sleeping cars. The sleeping cars are ready for occupancy at 9 p.m., and passengers are allowed to remain in them until 8 a.m.

The sleeping-car trains handle much theater traffic. They serve as "owl" trains for the middle section of the road and as early morning trains for the section near the arriving terminals.

A train crew for a four-car train is made up of a motorman, conductor, brakeman and two sleeping-car porters. The porters are paid \$45 a month and perform duties similar to those of Pullman-car porters.

The sleeping-car trains undoubtedly have created traffic for this railway. Practically all of the passengers who now take the sleeping-car trains, both in the coaches and in the sleepers, would otherwise have taken steam trains. One reason for the success of this service is that the passengers can go to bed in the sleeper at one terminal and be at the other one at 7 o'clock in the morning for less expense than the cost of a hotel room in either of the terminal cities. The berth fare between Peoria

and St. Louis is \$1.50 for a lower and \$1.25 for an upper; between Springfield and St. Louis, it is \$1.25 for a lower and \$1.00 for an upper.

The sleeping-car trains, as a whole, earn about \$40,000 net a year, and the earnings are practically the same for summer and winter. The



FIG. 102.—Combination train on Illinois Traction System consisting of baggage and passenger motor car and sleeping car as trailer.

average gross earnings of a month are about \$6000, the expenses are about \$3000 and the net profit about \$3000. In these expenses are included the wages of motorman, conductor, supervisor of sleeping cars, porters,

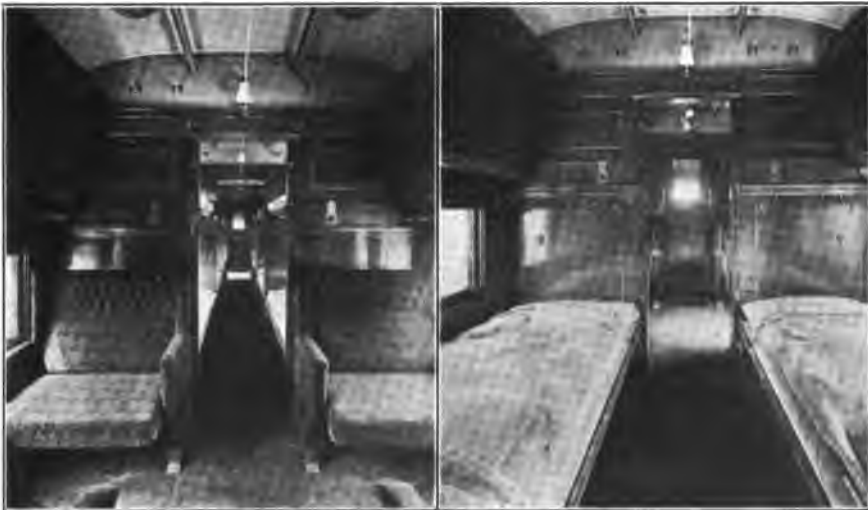


FIG. 103.—Interior views of sleeping car, Illinois Traction System.

laundry, advertising, car cleaner, etc. This does not include charges for maintenance of track or roadway, or general expenses or overhead charges, the idea being that the sleeper service should bear none of the overhead, as the expenses were not increased on account of having this additional

service, also that the maintenance of track and roadway would be no less even though this service was discontinued. The cost for laundry is about \$30 per month per car, not including wear and tear.

The experience of the Illinois Traction System would indicate that there is a field for the interurban sleeper especially between towns where a man would have to board or leave a through steam train at an inconvenient hour. Electric sleepers would not have to travel at breakneck speed and would attract many commercial men who now take an evening train on the steam railroad to get to a hotel in the next town.

Funeral Cars.—The fact that funeral-car service is confined to very few cities of the United States, like Philadelphia and Baltimore, although widely used in Mexico and South America, proves how persistent prejudice can be. The Egyptian picture writings show us that sleds were used for funeral vehicles long after wheeled chariots had come into use. So too, do we stick to the horse-drawn hearse instead of adopting the cheaper and far more convenient trolley car.

The Aurora, Elgin & Chicago Railway operates a funeral-train service to and from the five large cemeteries along the line, the larger part of the traffic originating in Chicago and being shared jointly with the elevated railway. No funerals are handled on regular trains, only chartered cars being used. In 1911, the revenue from this service amounted to more than \$1000 per month.

Prison Cars.—The field of ambulance cars is naturally very limited in ordinary times, since the transfer of groups of patients is unusual. This limitation does not apply in the case of prison cars because the transfer of prisoners between the jail and the courtroom may occur every day in the year. Such transportation should cost less than the usual "Black Maria."

Some years ago, when the City of Berlin, Germany, wished to erect a jail for confining short-term prisoners in the suburbs of Tegel, the latter municipality agreed to its construction only on condition that the prisoners should be brought in without attracting attention and that discharged inmates should not be released in Tegel. The police department settled this question by making a contract with the Grosse Berliner Strassenbahn whereby the street railway company furnishes a motor car and crew to haul from one to three prison trailers every day between Berlin and Tegel. The cars were built by the police department and contain thirty cells each. As they are brought directly into the prisons at each end over special sidings, the public never sees the unwilling passengers. The entire run is 12 km. (7.4 miles). The street railway receives 1 mark per car-km. or about 40 cts. per car-mile for the service.

The Montreal Tramways has been operating since 1913 one car twice a day between Montreal and the prison at Bordeaux, 7 miles distant. The car is sheathed in steel, and is lighted by way of the monitor windows and

small sash at the top of the side panels. It is 48 ft. 4 in. long over all and 34 ft. 8 in. over the seating section. The latter is divided in two partitioned cross-seat compartments for keeping convicted persons separated from those merely accused. The guard has an elevated seat at the rear, while other officials may use the rear platform. The car carries its passengers directly into the prison yard over a special loop. The latter is also available for the delivery of supplies.

Ambulance Cars.—Ambulance cars are not used in this country, but several have been built for South American companies in co-operation with local hospitals. At this writing hundreds have been improvised on European tramways in connection with the war. But this is not the kind of traffic development that American railway men will be anxious to have.

CHAPTER XII

TRAFFIC SIGNS FOR CARS, STATIONS AND ROAD— INFORMATION FOR THE PUBLIC

The following paragraphs summarize American practice in giving information to the passenger by means of audible or visible signs outside or inside the car or by announcements at stations or along the road.

Route Signs for Cars.—The lack of car signs that can be read within easy stopping distance is a standing complaint of the public in many of our cities. When a sign cannot be read in daylight beyond 50 ft. the prospective passenger is likely to make every car stop until he gets the right one. This is not good for his temper or for that of the motorman.

The trouble is that railway operators are so familiar with the routes of their different cars and whether they stop on the far or on the near side of the street that they think everybody also is equally well informed. No doubt habitual riders have little use for signs except for some simple indication of the route. But strangers can hardly be expected to know that a car marked "Main" is the proper car to take for the railroad station which is on Connor Street, or that an elevated or subway train with two red markers and two white markers will make local stops, whereas one with three red markers and one white marker will make only express stops. The only course open to him is to mount the steps and have a parley with the conductor, a plan which is likely to delay the traffic and exasperate those who are thus prevented from boarding.

In horse-car days the cars of every little competitive line were not only distinctively and vividly colored, but they also carried a cyclopedia of data about their routes.

As city properties were gradually merged, it was natural to adopt one color scheme for all routes, and to eliminate all lettering except the car number and the name of the railway. The sign then dwindled to a mere word or two, one type of sign consisting of painted panes in the ends and sides of the monitor and another of a simple board or block suspended from the hood.

The block sign is four-sided in order to display both terminals and intermediate destinations. The lettering usually is in white or aluminum paint on a black background. As the letters are but 4 in. high it is evident that this sign is not worth much. At night it is worth still less because it is not effectively illuminated.

A sign of this kind can become a source of irritation and litigation as is illustrated by a case where a passenger on the New York Railways sued the company because a transfer had been refused to him. On the route in question cars were operated to two destinations. The passenger asserted that owing to the illegibility of the signs he thought that he was on a through car. When he asked for a continued-trip transfer from the short-line car it was refused in accordance with the company's rule that a transfer is issued only on payment of fare. The New York Supreme Court Appellate Term decided on July 5, 1913, that the passenger was entitled to the statutory penalty of \$50 (*Lehman vs. New York Railways*), on the ground that the sign was not sufficiently conspicuous.

Other railways, particularly interurbans, use a dasher or hood sign comprising a lamp box with holes cut to form the letters which designate the route or destination. These are legible and somewhat better than the wooden signs, but they still leave much to be desired unless they are simply large, single initials.

The best sign is of roller destination type. Any desired number of destinations may be painted on the roll so that cars may be used at once on other lines without changes. Vestibule signs of this type are lighted from a special lamp box since the vestibule itself should be dark. Roller signs at the sides of the car, however, receive ample illumination from the interior lighting.

No hood or vestibule sign of any type will be readable at the distance of a city block if it attempts to carry full names. Hence many companies as on the Pacific Coast are now using illuminated initial letters or numbers which can be made to a height of 8 or 9 in. Sometimes they are the only signs at the front of the car. In San Francisco, the number sign is a perforated metal box placed on the roof over the bulkhead line. In Pittsburgh, the sign is mounted in the same place and is of sheet metal with a hinged top of wood, the numbers showing white on a black background. In Philadelphia and Buffalo the route numbers are displayed behind a corner vestibule sash, Philadelphia adding the destination below the number while Buffalo places the destination behind the center vestibule sash. The Philadelphia Rapid Transit Company also distinguishes short-line cars by a red band diagonally across the route number. This band is dropped into place by a motorman.

The dasher is used for special placards, as the "limited" of the Boston surface cars. Another combination of initial letter and destination is used at Peoria, Ill. Here the route sign carries a 12-in. perforated initial letter illuminated by means of reflected light, while the full name of the destination is given in painted letters 3 in. high.

The United Railways & Electric Company of Baltimore uses as a vestibule sign the hundreds class number of the cars employed on a given

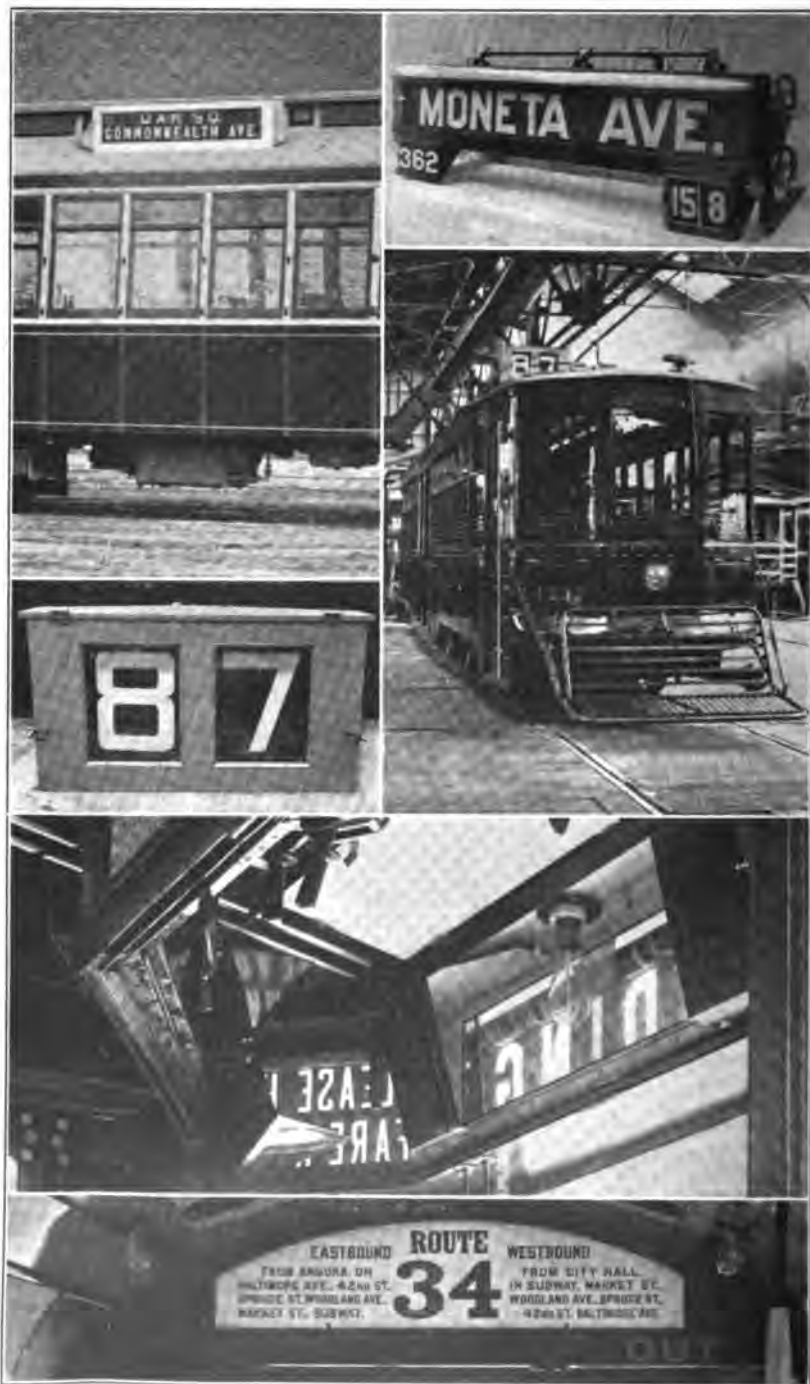


FIG. 104.—Various route and destination signs.

Roller roof sign, Boston. Double roller sign, Los Angeles. Route numeral dismounted and in place, Pittsburgh. Lighting of roller hood sign, Bay State Street Railway. Philadelphia route sign in bulkhead arch.

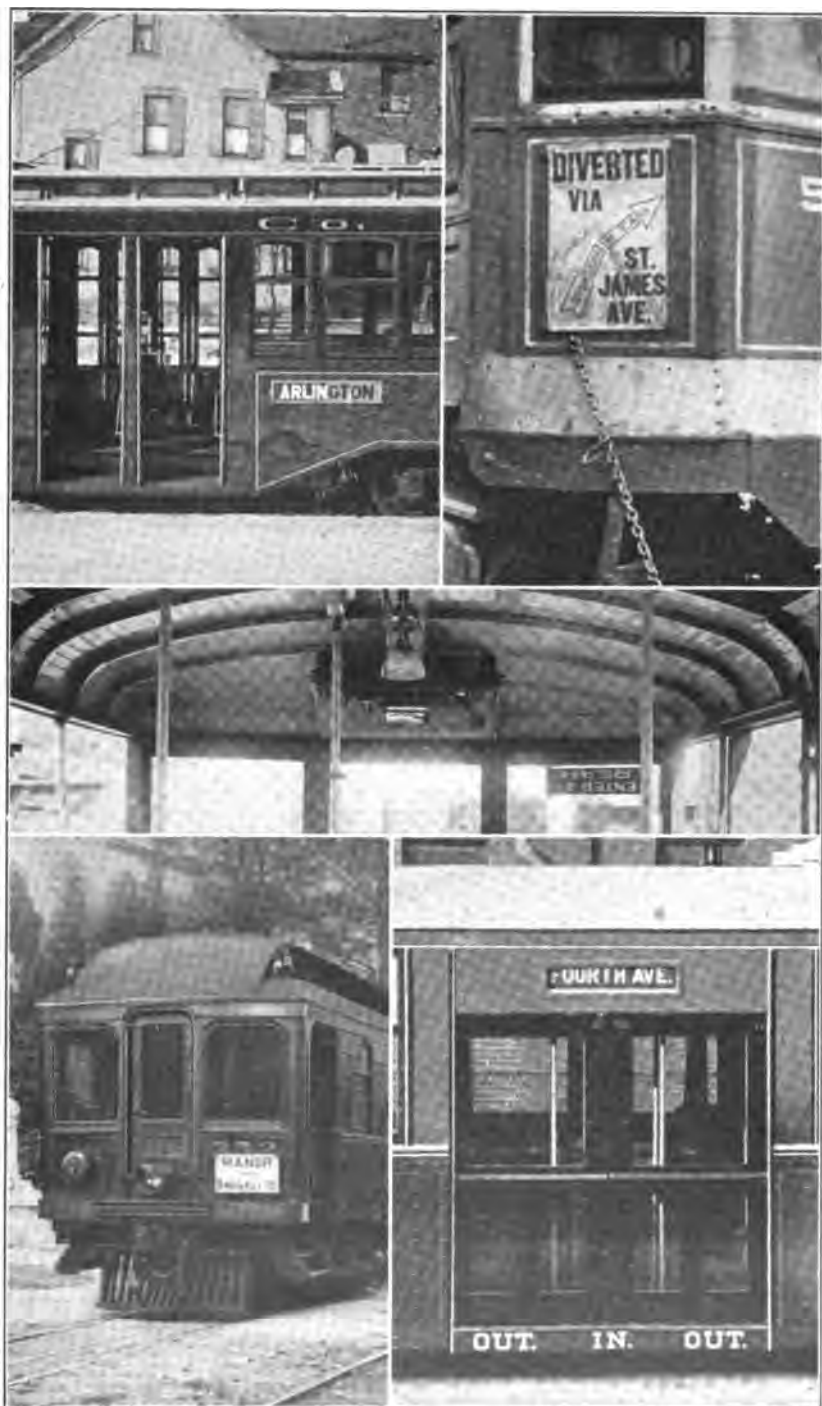


FIG. 105.—Various route and destination signs.

Two color entrance signs, Pittsburgh. Paper poster of diverted route, Boston. San Francisco boarding sign. Dash sign for Sausalito interurban. Roller sign over center entrance, Louisville.

line. For example, the cars on Gilmore Street are numbered 100, 101, 102, etc., and the illuminated ground-glass sign carried in the vestibule therefore shows a large "1." Baltimore people find this convenient as it corresponds to the system of car numbering which has been peculiar to Baltimore for many years.

In Boston the front roller type sign $5\frac{1}{2}$ ft. by 11 in. extends clear across the end of the monitor roof. At one side is a number, the first figure giving the number of the division and the other two the number of the route. Thus "942" means Route 42 of Division 9. When cars must be diverted for some reason, a pink paper poster, 14 in. by 21 in.,

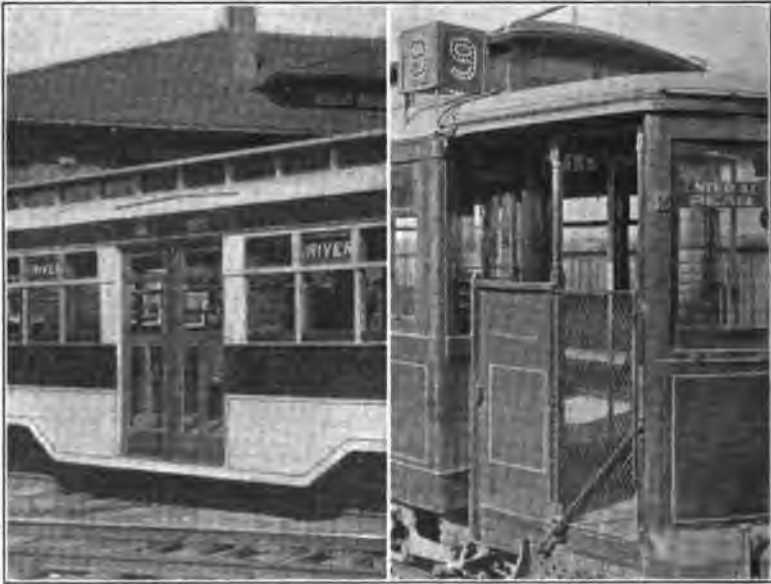


FIG. 106.—The left-hand view shows a Detroit trailer route sign carried on each side of the center entrance, the right-hand view shows the numeral route sign used on the San Francisco and other Pacific coast cars.

is clipped to the dash. The main feature is a broken arrow calling attention to the change of route and the name of the street temporarily used.

In the roller type destination sign of the Los Angeles Railway 5-in. letters are used to indicate the destination without any larger number of initial. The unusual feature is that the lower left-hand corner of the sign bears the car number in figures, $2\frac{5}{8}$ in. high, made directly on the glass, while the run numbers 3 in. high are carried from an auxiliary roller at the lower right-hand corner. The run figures are made on two separate strips of cloth, one with numbers from zero to 8 inclusive, and the other with numbers from 1 to 20 inclusive, giving a total from 1 to 200 inclusive. The extreme height, depth and length of the sign are

16 in., 11 in. and 5 ft. 3½ in. respectively. As it is also illuminated by three 15-cp. lamps, it is one of the most satisfactory destination signs in use to-day.

The Bay State Street Railway, in 1915, adopted a sign made up of a roller destination sign with letters 6 in. high, placed behind the center vestibule sash, and side signs behind the corner vestibule sash to carry special announcements.

Side and Front Signs for Cars.—It is customary for European cars to carry along the roof elaborate non-illuminated signs which show what streets are traversed and the names of important public places along the route. These signs are very helpful to the stranger, but more or less disfiguring to the car.



FIG. 107.—Side route sign on end entrance car in Buffalo. Limited stop sign in Boston. Vestibule route sign in Buffalo.

In the United States the illuminated roller sign is replacing the old-time painted-on-glass sign, although some companies have merely substituted perforated metal signs which can be shifted from car to car without breakage. Side signs may be almost as long as the carbody, and therefore many state the routing as well as the destination.

The Philadelphia Rapid Transit Company has substituted for the clerestory side sign a vertical panel alongside the doorway. This panel gives the routing in addition to the number. Thus before entering the car the passenger has the opportunity of checking himself against the shorter vestibule sign. Buffalo places its side sign behind one of the car windows.

As front signs, except lights, are impracticable on fast-approaching subway or elevated trains, the individual cars on rapid transit lines are fitted with destination signs in the corner windows.

The Aurora, Elgin & Chicago Railway uses butterfly or folding signs to prevent misunderstanding by passengers waiting at stations where the train is not scheduled to stop. It also avoids the loss of time by passengers mistaking one train for another, as, for example, flagging an Elgin Limited when they want to board an Aurora Limited. The sign shows the destination only when open. When closed, the sign blends with the color of the car. The sign is carried just below one of the vestibule windows.

European railways also display over a window within the car a sign which gives a statement of headways and schedules, rate of fare and other data peculiar to the given route. This plan has been cleverly adapted for American conditions by the Philadelphia Rapid Transit Company which places announcements over the archway and at the center of the car. The wording receives great care to secure such compactness that large type may be used. Thereby, passengers can read the placards from their seats and read them quickly.

Brevity is much to be desired in statements concerning transfers, temporary re-routing and the like. Passengers simply will not read long tales. Often the text can be cut short by printing separate placards for each line or group of lines rather than try to make one announcement cover the entire system.

Company Cards.—The Philadelphia plan recalls the fact that while many railways have standard shapes and styles of placards, they treat their display in a rather step-motherly fashion. The railway sells its space for the advertisements of others. When it has an announcement of its own to make it disfigures some car windows by pasting large sheets thereon or hangs a cardboard just where it will cut the neck of a passenger or knock off his hat. Sometimes, in open cars, placards are attached to the ceiling where no one can read them without craning his neck.

If car publicity is worth pay by merchants, the railway can afford to lose a little revenue to gain respect for its own announcements. By contracting to reserve a certain space for itself, passengers will get the habit of looking for railway announcements as a matter of course.

Verbal and Visual Street or Stop Announcing.—A source of annoyance to the stranger is to miss a street because of the conductor's thick enunciation or by the latter's entire absence of street calling. Instruction in clear speaking is the obvious remedy, but if many actors are poor speakers, what can we expect from conductors? Only one or two companies have even tried to solve this puzzle.

Among the attempts to cure has been the use, to a small extent, of both audible and visual devices. The audible method has been to use a megaphone or a phonograph. While this may do for a station, the frequent and loud calling of the streets would be annoying to the home riders who naturally are in the majority. The visual method calls for the use of an indicator which shows the next crossing a block ahead in order to give the passenger time to alight. To be available for city service, such an indicator would have to carry hundreds of names. Its automatic operation so far has called for complicated mechanism. Operation of such a mechanism by a conductor during heavy travel would be folly.

A simple visual announcing scheme suitable for non-street railways is the arrow sign of the London Underground Railways. As the passenger sits in the car he sees a card the large arrow on which is pointed in the direction of running, and below the arrow is printed the order of the stations in that direction. One need observe only the name of any one station to ride in peace of mind thereafter. The London company also displays outline maps of the individual route in the cars, while the maps of the system as a whole are prominently displayed at stations. In this country, the Hudson & Manhattan Railroad carried maps on the doors of the cars at first, but gave them up as the routes became better known and because the maps were rather costly and easily injured.

Signs and Announcers at Stations.—For train-departure announcing at stations many railroads use men or phonographs. Others use large bulletin boards at the departure tracks, but not where cars for several different points use the same track at frequent intervals. Roller signs would do were it not that many passengers like to know at once when their trains are to depart without consulting a timetable.

In European stations one may observe a large board or poster naming the departure time of all trains either in the order of time or of the alphabet. An improvement on this scheme is the Illinois Traction System's terminal time card. This shows the trains one after another, the leaving time being in larger figures than the accompanying arriving time at the destinations. One can run his finger down the leaving time column to find the train he wants and then note its arrival at his destination.

Various forms of illuminated glass signs or sheet-metal drop signs are also used here and abroad to indicate the arrival or departure of trains on stated tracks. Such signs are under the direct control of a station attendant or are operated by remote control from the dispatcher's or signalman's tower.

At important loading points much confusion can be avoided by stopping the cars of specified routes at certain places as indicated by signs. This arrangement is a matter of course in terminals and large junction

stations, but not on the street itself. A good example of street-sign practice may be observed near the West Philadelphia station of the Pennsylvania Railroad. There, residents and strangers alike station themselves just where the car will stop. When the car comes its route number and other designations make assurance doubly sure.

A further discussion of the subject will be found in the chapter on "Accelerating Traffic Along the Line."

Way Signs.—Electric railways use a great variety of way signs. In cities the signs preferably are hung from the wires, but in outlying sections it is advisable to paint them on the poles to avoid damage by vandals. The best enameled shields are none too good for suspended signs. A rust-streaked, dilapidated placard is a poor advertisement for the railway. In rare cases, as at Charlotte, N. C., a sign has been set in the street paving. This consisted of a metal grid bearing 8-in. by 3-in. letters "stop" raised $\frac{3}{8}$ in.

There are two classes of way signs—those for the car men and those for the public.

Way Signs for Car Men.—The chief way signs for the car men may be summarized as follows:

"Section Insulator" or "Circuit Breaker" to warn the motorman that he must go to "Off" position.

"Electric Switch," usually placed 100 ft. in advance of the switch and indicating that the motorman is to move his controller as directed by the rules.

"Fire" "School," "Church," "Theater" and the like, denoting compulsory stops at appropriate times. The "Fire" stop, however, applies at all times.

"Cars will not pass on this curve," referring to lack of clearance. This sign might be supplemented by one to the public reading: "Dangerous to stand between tracks," for use at such curves and for narrow devil strips generally.

Arrow signs, the direction showing which of the intersecting lines has the right-of-way. More than one collision would be avoided by their use.

Speed Limit, Warning and Stop Signs.—The Public Utilities Commission of Connecticut has standardized such signs in that state as follows:

Stop.—Face red, letters black, back black.

Slow.—Face yellow, letters black, back black.

Whistle.—White field, black band, black letters.

Speed Limit.—Face yellow, figures black, back black. Dimensions: Vertical diagonal of board, 13 in.; horizontal diagonal of board, 12 in.; thickness of board, $\frac{3}{8}$ in.; height of figures, $6\frac{1}{8}$ in.; distance from top of rail to sign, 5 ft.

Warning.—White bars on black field: four poles away, four bars; three poles away, three bars; two poles away, two bars; one pole away, one bar.

Station.—White band, black rings, black figure.

The most important sign of public interest is the "Stop" or "Station Stop" indication. It is disconcerting for a stranger, if he is in a hurry to catch a train, to stand on a near-side corner and see a car shoot past him, and it would be equally exasperating if he should stand on the far-side and be obliged to risk his neck in a hurried crossing when he saw the car which he expected to take stop 50 ft. or 75 ft. away. Enough signs marked "Cars stop on this side" should be installed to relieve all uncertainty as to the side of the street at which the car will stop.

Another sign of public interest is that addressed to vehicle drivers. It is especially desirable to have such signs near carhouses to warn drivers against accidents. Such signs were prescribed in 1914 by the Public Utilities Commission of the District of Columbia.

Speed Warning Sign.—A speed warning sign used on the interurban lines of the Detroit United Railway is worth mention. The sign tells the passenger that it is dangerous to cross the tracks in front of a high-speed car, and instructs him how he can signal it in safety. Such signaling is quite a problem at so-called flag stops or wayside crossings. The waving of a piece of burning paper is decidedly archaic. A semaphore and light signal set at a height inaccessible to children should be placed on the pole nearest the crossing.

TRAFFIC INFORMATION FOR THE PUBLIC

Timetables.—The basic form of information for the public is the timetable. In its simplest form, it is a pocket card of paper or celluloid, usually showing headways in the case of a city line or the actual departure and arrival times in the case of an interurban line. In the larger cities cards are issued only for owl or suburban service.

The United Railroads of San Francisco issues an owl service card which must be highly appreciated by the townsfolk inasmuch as the headways vary from 30 to 60 min. This owl schedule also carries on its service side a list of the routes by name and number so that even the stranger soon can take advantage of the route number system.

The San Diego Electric Railway issues a similar route number card, but adds a brief description of the course of the car and the chief points of interest or traffic use (as steam railroad stations); it also issues individual card schedules for suburban lines, as to Tent City, using the other side of the card for a guide to points of interest.

The Conestoga Traction Company, Lancaster, Pa., issues card timetables even for lines with a 7-min. service during the day.

A favorite form of timetable distribution in Europe is to print the

schedule, particularly for the slack hours, on a window poster. Each poster, of course, refers only to the line on which the car operates. Pocket cards, as issued in this country, are preferable since they cover the system as a whole.

Schedule Cards or Boards.—Another way of apprising the city and suburban rider of the service is to display schedule cards in store windows or on house walls at important traffic locations. Usually such cards show the schedules for all lines. Sometimes, as on English roads, use is made of illuminated transparencies which show direction and give schedule facts. At Topeka, Kan., an illuminated sign reading "Cars Leave this Point every Five Minutes Reaching All Parts of the City" attracts the thrifty traveler as soon as he emerges from the union railway station. This sign gathers many fares that would otherwise go to the auto-bus or taxicab.

For the cross-country line, little trouble or expense would be involved to place at a convenient shelter or even on a pole the passing time of the cars. A railway of this type may not be able to give the service of the high-grade interurban, but it can serve its patrons with the same precision. Long-distance trolley riding from town to town for pleasure will never be developed to the full until such a measure as this is taken. The objection urged is the expense of changing the schedule boards when the schedules themselves are changed. This is a trifling matter since most railways do not change schedules except from summer to winter and *vice versa*. The Sunday schedule, if materially different, could be added to the board. One Virginian railway, which has signs like this at all stops, also posts timetables at prominent street corners in the town, so that even a person who is in town for one day can become as familiar with the street railway service as the native.

The Berkshire Street Railway places 3-ft. by 6-ft. schedule boards under the municipal lights so that the company has no expenses for illumination.

Schedule Dials or Clocks.—Clock dials, one for each line, may be used in the waiting rooms or at crossings on the road. In the waiting rooms an attendant moves the hands to the correct positions; in the latter the conductor himself leaves the car to adjust the dial to show the time of the following car. Another plan is to paint on the dial of an ordinary clock red hands to show the divisions of the hour at which the car passes that point.

In a headway clock first used at Metz, Germany, in 1913, the lower half of the dial is divided into the number of minutes which represent the longest headway on the system. The minute hand, which travels over these numbers, moves from the highest figure to zero, thus showing within how many minutes the next car is due. So without consulting a watch

or timetable the prospective passenger can see how long he must wait for the next car. On reaching a regular stop the conductor leaves the car and with a key sets the indicator for the prevailing headway. The setting of the minute indicator also winds up the clock spring for a complete run over the dial. When the indicator reaches zero it remains there for 2 min. to take up minor delays in the schedule. If the delay exceeds 2 min., the indicator moves beyond zero to the section marked "out of service," thereby indicating some unusual delay. The clock dial is about 9 in. in diameter. The cast-iron housing is larger than necessary as the space above the dial is used for advertisements.

Timetables for Interurban Lines.—Interurban timetables vary from the pocket card to the blanket folder of steam railroad style.

Pocket cards of individual lines will serve the regular patron very well, especially if made of durable celluloid. These cards can be distributed from racks in the cars, while the folder covering all lines should conform to the standard steam railroad size suitable for the folder racks of hotels and stations.

Timetables should show all connections, whether by steam or electric lines. This will be appreciated by the passenger and may lead to like courtesies by the steam railroad. For example, in the spring of 1914 a Lehigh Valley Railroad booklet showed the transportation service of all the electric railways within its territory. The schedule and rates of fare were given in alphabetical order for several hundred towns, in only twelve pages. This compact and convenient form was obtained through the use of a simple key. Numerals opposite the locality corresponded to the name of the electric railway, while letters were used to indicate the headway during the greater part of the day. Hence practically all the facts that the rider needed were in one pocket folder, so that he could plan for more extensive trips than if he had to look for individual timetables as he traveled from line to line. It is not to be expected that a steam railroad should advertise a paralleling electric service, but it serves its best interests when it gives the widest possible publicity to the fact that hundreds of attractive spots can be reached by a combination of long-distance steam railroading and short-distance trolleying.

A similar broad-minded plan of advertising other interests is followed profitably by the Detroit United Railway. Through the constant display of banners and car cards steam road excursions from different points on this company's lines are announced; attractions at theaters in the important cities along the route, circuses and carnivals are also advertised. In fact, any and every form of entertainment in which the passenger department believes the public will be interested is called to its attention. This practice has tended to make new patrons and increase the traveling propensities of the regular riders.

In preparing advertising of this kind the entertainment is first announced and then the public is urged to use the cars to reach the point where the entertainment is to be given. One needs only to compare the attendance at a circus side show where there is a widely advertised two-headed calf with that at the unadvertised museums of natural history to determine whether this form of advertising pays. In 1915 the Detroit United Railway had an opportunity to test the public's interest even in this direction. It called attention to the existence and location of an art museum where the attendance had dwindled because no form of advertising had been used, and the result was most profitable to the company. Electric interurban and street railway companies usually announce the dates of county fairs, circuses and other important events, but they often fail to keep constantly before the public the permanent points of interest to which regular travel may be maintained. One phase of the Chicago Surface Lines' advertising campaign has been along this line, and the results indicate that the constant use of all forms of advertising is certain to kindle the public's desire to travel and thus aid in increasing revenue.

Timetable with Through and Local Trains Separate.—In 1911 the Illinois Traction System began separating in its timetables the through trains from the local trains. Instead of placing the trains one after the other, in the sequence of their arrival and departure, all the limited trains are placed on one side of the name of the town and the local trains are placed on the other side. This is done on the theory that the two classes of service are used by two classes of customers. The traveling man who takes long rides does not care about local trains, and an arrangement of this kind prevents him from making the mistake of riding on a local. In its timetables the company also gives other useful information, such as the location of its stations. These tables are of pocket size.

Timetables are sometimes combined with advertising, as when the Winona Interurban Railway, Warsaw, Ind., mailed in 1911 a timetable in the form of a double postcard. On the address side appeared the following:

"Our Assets—first-class track and roadway, new curves, new cars, fast schedule, quickest route from Peru and points south to Goshen and points north. *Our liabilities*—to please the traveling public. Keep this card for reference."

The inside pages contained timetables of the through service between the different towns on the line and also the connections with other lines for through runs. The back of the postcard folder showed a map of the Winona Line and Indiana electric and steam connections.

City Booklets or Folders.—Many European tramways issue information booklets at a nominal price. Such pamphlets contain not only a route and street guide, but data on the location of parks, public buildings,

theaters, concert halls, schools, museums, art galleries, etc. Of course, few European cities are without tourist travel, but many natives buy the book for their own information. A large number of people love music, paintings and nature, but they will go oftener if they are reminded by means of such publications.

If a local publisher issues such a guide, the railway should be sure that every one of its transportation men has a copy. This has been done with gratifying results at Portland, Ore.

The Philadelphia Rapid Transit Company which has done so much work in improving car destination and route signs has also been the United States pioneer in really comprehensive city booklets. The book issued free in the latter part of 1913 comprised 104 pages 2¼ in. by 4 in. in size with notes on the following subjects:

Bureau of information, car-sign system, chartered car rates, fare limits of suburban lines, index to routes, house-numbering plan, how to obtain copies of the book, how to reach points of interest, lost articles, pairing of streets, rates of fare, telephone numbers and Willow Grove Park.

The Philadelphia Rapid Transit Company deserves special praise for explaining the pairing of streets in those cases where the inbound car uses one street and the outbound car another. A stranger can lose a lot of time and gain an equal amount of vexation before he learns that cars are not run in both directions over the single-track line on which he wants to ride. Street signs showing the direction of running and mentioning the pairing street would be still better.

It may be suggested here that if a house-numbering plan is included in a booklet it should show the number of the house nearest to a given cross street. This plan is followed by the New York Telephone Company in listing its pay stations. A further suggestion is that the location and product of the principal factories be stated, for many people are interested in business if not in sightseeing.

Special Publications for Stop-over Sightseers.—In America it is a wise manager who guides the stranger within his gates. At stop-over points where long journeys are broken it is common to hear the question, "How can I see the most interesting sights of this town in an hour or two?" Yet many companies do nothing whatever to encourage this class of travel, aside from special extra-fare sightseeing cars.

Let the company issue a folder showing at least a skeleton map of accessible lines and street relations with the prices and time required for trips of 30 min. to 2 hr. each. Let these folders be placed in the hands of tourists at waiting rooms and where possible on trains. Combine this publicity with an electric sign or two near the station exit—a neat illuminated billboard mounted on a feeder pole is better than nothing, and

results will come. The type of car passing the station and the character of its signs are also factors in the stimulation of this limited-time traffic. Most of it is short-haul and hence more profitable than double the volume of business handled over greater distances.

Traffic Folders.—The use of folders with a map and half tones of noteworthy places is a common form of advertising. Such folders are issued in a wide variety of printing quality and textual elaboration. As the expense of these folders is considerable their publication for free distribution is usually warranted only to advertise fairly long runs, say those for which the fare is 15 cts. or more. For such class of traffic circulars a few general hints will be offered as follows:

Use high-grade ink, paper and illustrations as typical of the quality of service given. Multi-color work is costly, and the excess over ordinary one-color or two-color work can be employed to more advantage in using a better quality of printing material. The folder should be made so good that people will want to keep it for the pleasure-travel season at least.

Much money can be saved by printing large editions. It is therefore advisable to order enough folders to last several seasons, unless some important traffic attractions will be added during the period in question. This means the omission of schedules other than general statements about the frequency of service. Timetables should be printed on cheaper paper and issued with the folder if desired. The photographs can be taken with a postcard-size kodak. Many excellent views can be obtained and public interest aroused by offering prizes for photographs. If the property is not large enough to employ a press agent, a local newspaper man should be engaged to write the folder in a style that will make people read it. The information should be arranged in the order of riding so that he who rides may read. A map should be included because people like to know where they are going. If there is much descriptive matter in the folder the map should show by numbers the places described in each paragraph. The size folded, should be 4 in. × 9 in. to enable the folder to fit into the standard timetable racks and it is well to have the name of the company or of the route displayed prominently on the front cover to identify the folder while it is in the rack.

If the city is fortunate enough to get conventions from time to time, a space can well be left on the front and back pages of the folder for the names of the organizations. This will cost little and will flatter the visitors.

Distribution of Folders.—It is easy enough to distribute folders; the difficulty is to get them into the hands of probable riders. So far as the local public goes, a card in the cars and a small advertisement in the newspapers stating that the new folder will be sent on receipt of postage or a trifle more will greatly decrease waste. If these advertisements are

run early in the spring it may be possible to gage the necessary edition from the number of orders received.

Hotels, railway ticket offices and railway stations offer another channel of distribution. These places harbor travelers who spend dollars and not nickels. Also there is no reason why some folders should not go to ticket agencies hundreds or thousands of miles away. For example, a man going to St. Paul from Chicago via steam railroad should be a good prospect for a sightseeing trip or two; and he will be likely to ride more if he can map out his program in advance. It is absurd to place costly folders in street cars for the business obtained will not be in fair proportion to the expense.

A third way of distributing folders is to give them directly to convention delegates. Visitors are always in a receptive mood for sightseeing, and they are likely to prefer the cheaper and spacious car to the auto-bus if the electric railway company shows the same hustling spirit as the bus men.

Map and Letter Advertising.—As children are good boosters of pleasure travel, the Bay State Street Railway gives maps to all schools in its territory, encouraging the study of commercial geography and familiarity with its lines at one stroke. The company even furnishes tin frames for hanging the maps. This company also prints a map of the Bay State system on the back of its letter paper.

Many railways print short advertisements about their property on the back of their letter paper. These sheets may be so folded that when the letters are opened by the person to whom they are addressed, the advertisement is the first thing seen.

Association Traffic Publications and Bureaus.—In addition to individual publications, groups of electric railways throughout the country are represented in traffic guides. Such joint efforts are of great value to the public and encourage long-distance riding if proper care is given toward furnishing through tickets and good connections. Sometimes the guide is a private venture to which the railways contribute maps and timetables; sometimes the electric railways co-operate formally as in issuing the general map of electric and steam lines of the Central Electric Railway Association.

In 1914, the Illinois Electric Railways Association published three sizes of maps: One suitable for the backs of standard letter sheets; a second, 30 in. by 18 in. to include steam railroad and steamship connections, and a third, 36 in. by 50 in. in three colors, showing all steam and electric railways complete. The Chicago Elevated Railways and the Aurora, Elgin & Chicago Electric Railway are the chief distributors of these maps.

The New England Street Railway Club for years has issued, in the

interests of the electric railways in New England a guide called the "Trolley Wayfinder." It is sold for 10 cts. a copy and contains maps and timetables of all suburban and interurban runs in the six New England States. The timetables show not only the leaving times or headways of the cars but the miles of route, fares charged and running time both total and between intermediate towns. The New England Street Railway Club also maintains a free trolley information bureau at Boston where any special information about trips required by the traveler may be obtained.

It is good policy for electric railways to refrain from entering the something-for-nothing advertising scheme, in the publication of railway traffic data. A company may see no harm in agreeing to let someone print and distribute its timetable and descriptive text free of charge, but inquiry will develop the fact that the publisher expects his revenue to come from the merchants of the district. As one railway man has put it:

"The merchants along the line must surely get tired of the importunities of the solicitor, and they have the right to think that the electric railway is big enough to get out its own printed matter without the help of outsiders. Timetables should not be made a medium for a miscellaneous lot of advertising, secured from the business men upon whom the railway depends for traffic."

Photographs, Postcards and Stamps.—The traveler on the Pacific Coast is struck by the abundance of photographs of Nature's beauty spots, not merely in railway stations and hotels but in almost every business office. Thus is aroused the desire to travel that has made the Westerner famed for his love of outdoors. In English steam railway coaches, too, one may see excellent photographs of seaside resorts, medicinal springs, mountain retreats and the like.

This form of advertising is in its infancy throughout most of the United States. True, the first cost of placing a framed photograph is large, but it is a permanent advertisement. If the electric railway is the only or the best-known route, no advertising text is needed on the picture and this fact will add to its attractiveness in the eyes of many.

The humble picture postcard is not to be despised. Such cards with a bit of description may be mailed with good results to a selected list. They may also be sold to stationery stores at nominal prices. More recently the colored stamp has become a fad. This was first developed for safety work. It is just as suitable to carry the company's slogan or offer of service. The San Francisco-Oakland Terminal Railways, for example, uses on the back of all its mailed envelopes a stamp on which it names the towns served.

Car Advertising.—Through the help of the larger and better organized advertising companies, railway companies are securing substantial returns from car advertisements carried in the side rack and end rack spaces in

their cars. This same kind of advertising is most appropriate for the announcements of the railway company itself, partly because the car is the property of the company and partly because persons, while riding, naturally have their minds on travel. Hence they are in a receptive mood to read what the company has to say on the subject of public relations or safety, or in the promotion of travel on its lines. For such advertising, newspaper space should have secondary, not primary place. A car card used by the Illinois Traction System to advertise its service to the State Fair is shown in Fig. 108. Obviously the best location for a company advertising card is separate from the regular card advertisements. By segregating it the company will also be saved the expense of preparing an expensively decorated card such as might be necessary if it was made to correspond in general appearance with the cards from the national advertisers in the paid racks.



FIG. 108.—Car card used to advertise service of Illinois Traction System to State Fair.

The rights of street railways under a contract which gives an advertising agency exclusive advertising rights on the cars, except for the company's own advertising, were well defined by Justice Sutherland, Supreme Court, New York, who said on May 19, 1913, in part:

"I do not think the placards of a flower show at Convention Hall and an automobile show at Exposition Park violate the injunction (granted against the New York State Railways). The managers of the shows paid the railways nothing for such advertising.

"It is its own legitimate advertising, under the contract (with the Electric Railroad Advertising Company) to call the attention of the people to any attraction for the purpose of getting them out and persuading them to travel upon its lines. The fact that incidentally or equally with the carrying railroad the show advertised profits by the display which the railroad makes does not make the display violative of the letter or spirit of the injunction."

"As to the baseball placards displayed on the dashboard of the cars I think a different conclusion must be reached. The "Baseball To-day" placards were hung

not only upon the cars going to the ball grounds but upon cars of other routes. These signs advertised the fact that baseball was to be played on that day, but did not indicate the route to the grounds."

"If the sign hung on the outside contains any matter which has nothing to do with the destination or route but is put on the car for the sole purpose of calling attention to the event itself or to the time when it is to be held, the sign then becomes objectionable under the judgment which has been pronounced construing the contract which the defendant made with the plaintiff with respect to advertising."

Furthermore, inside signs at the center of the car mentioning the shows and giving data as to routes, service, etc., were held permissible by Justice Sutherland.

Car Flags and Streamers.—A few companies use flags on the trolley poles to designate cars which go to their parks. Thus the Middlesex & Boston Street Railway uses a blue flag marked "N" on cars going to Norumbega Park and associates its use with the slogan of "Follow the Flag." Streamers are objectionable for regular use but are employed at times to carry the names of organizations which have chartered the cars so marked.

The Boston Elevated Railway in 1915 fitted the sides of an obsolete single-truck passenger car with a big map carrying oil paintings of tempting scenes such as, canoeing at Norumbega Park and dancing at Lexington Park. This car was paraded throughout the city during the pleasure travel season. The car campaign was backed by 1-in. single column display advertisements on the front page of the newspapers and by more than 150 billboards.

Car Folders.—As noted elsewhere some companies print general publicity folders or house organs at weekly or irregular intervals. Such publications usually do not contain regular timetables, but do give the service for special events. They also contain injunctions to take trolley rides among the wild flowers or apple blossoms; to go fishing, nutting, skating, hunting, etc., according to the season. Often, special trains are advertised to encourage such traffic.

The folders are placed in boxes which hold from fifty to seventy-five. On pay-as-you-enter cars, especially, the front boxes have a greater demand than those in the rear, so it is the policy to keep the folders constantly moving from the rear to the front in order to secure best circulation. One company's original expectation was that a good part of the circulation would be among passengers who would read the folders simply to while away the time spent in the car. Actually, most of the passengers take the folders from the front boxes as they leave the cars and place them in their pockets to read and study at their leisure. This company uses a special poster in the cars to advertise special features of the forthcoming edition. On the night that the old folders are removed from the box the new posters are put upon the front windows of the cars

with the reading matter facing the passengers. The boxes are empty all of the following day so that no confusion as to issues will result. The poster stays in sight on all other days beside the day when there are no folders in the car.

Probably the most extensive distributor and prolific inventor of folders is the London Underground Railways. Not only are these prepared for the encouragement of general pleasure travel, but also to show the quickest way of reaching all classes of schools, how to reach the churches where stated sermons will be preached the following Sunday, where the best country walks are to be enjoyed, and the like.

Billboards, Large Signs and Posters.—Billboard and poster advertising on a large scale is feasible only on the biggest properties, as the cost of attracting the passenger is much more than through the indispensable descriptive folder. Billboards are not necessary where most of the possible riders can be reached through folders, but they are a good means of attracting the attention of transients. San Francisco, for example, is a good tourist center. Here the Oakland, Antioch & Eastern Railway uses billboards to advertise the attractions of Redwood Canyon and the low cost of the trip. One reason for this advertising is that the traveler must go to Oakland across the bay in order to start at all.

At its largest terminals the Illinois Traction System makes generous use of large painted sign boards setting forth the merits of its several services. Three boards located in St. Louis illustrate and advertise the sleeping-car service, freight service, general train service and the protection afforded by automatic block signals. These boards are 10 ft. high and 50 ft. long and are painted in four or five colors. The wording and pictures on the boards are changed to keep them attractive.

In designing these boards, striking photographic views used in the regular printed advertising were reproduced in natural colors. For example, one board displayed a photograph of a piece of track and a block signal, the middle board showed one of the twelve 800-hp. electric locomotives built in the company shops, and a third board showed pictures of two sleeping-car photographs entitled "Good Night, St. Louis," and "Good Morning, Peoria."

The Illinois Traction System and a few other lines also make use of large electric signs.

In our large cities we see panel-size posters used occasionally to advertise the location of and visiting hours to public buildings, menageries, art galleries, aquariums, etc. These efforts are put to shame by the wonderful station poster publicity of the London Underground Railways, which also controls many bus and street railway lines. In no other city of the world is traffic cultivated so intensely. These posters are often of such artistic design that they have to be uttered with the care of bank-

notes to prevent employees from taking them for home decorations. One example will show how lively a tinge can be given to advertising so dry a subject as museums. Instead of black-letter or a picture of the building, the artist's characters, including Queen Elizabeth, Raleigh, Leicester and Essex, are shown grouped in a court assembly merely to bring out the fact that costumes of the Elizabethan period were on display at the museum.

The London company also uses posters to signalize the opening of new facilities and their correct use. The opening of the new Charing Cross interchange station which was built for passengers of the District, Bakerloo and Hampstead lines offered a fine opportunity. One of the posters was pictorial, showing the various connections by walkway, escalators and bridges, and included a view of the buildings overhead. The other poster gave some impressive figures of the cost of the station, its purposes, the amounts of different kinds of material required to build it and of the number of passengers served by the improvement.

Newspaper Advertising.—Advertising in newspapers should be considered only for its worth as a business-getting medium or to bring facts to the attention of the readers of the paper and not for expected effect on editorial policy. In fact, when a railway in bad odor with the public starts advertising heavily in the newspapers, the editors take joy in proving that they cannot be bribed. To add insult to injury, the advertisements themselves have been taken as the text for biting comment. An electric railway's operations are too naked to be screened by such obvious efforts to avoid criticism.

Business-getting newspaper advertising is that relating to schedules, special service, improved equipment and the "lost and found" department. City railways do not have to advertise regular service, of course, but it is good policy to advertise the special measures taken to handle big events. To be specific: On the occasion of a Paderewski concert, the Topeka (Kan.) Railway ran a two-column, 6-in. advertisement in the daily papers to announce that cars for all parts of the city would be on a certain track near the auditorium to give quick service to city homes or interurban trains. Advertising of this character is of value to the railway, to the public and to those in charge of public entertainments.

The Lackawanna Railroad is widely known because of insistent reference to its use of anthracite. As all electric railways are free from smoke and cinders, they must find some other salient feature to advertise. The safety of the passenger is a good note to strike. This has been done in much newspaper and other advertising by the Illinois Traction System on the very definite topic of automatic block signals.

One form of advertising originated by the same railway is the yearly publication of an eight-page illustrated section devoted entirely to the

Illinois Traction System. This is made up to standard newspaper size, and the reading matter is a straightforward account of technical and operating progress. This section tells in a bright newsy manner about all the new work that the company has done during the past year. It has been published by more than fifty Illinois newspapers serving a quarter million subscribers.

The Twin City Rapid Transit Company carries in summer in a number of the daily papers in Minneapolis and St. Paul a three column advertisement giving in table form a list of the places of greatest interest reached by its lines, a few words concerning each place, the car to take to reach them and the rates of fare. The International Railway Company, Buffalo, has used the daily papers extensively to advertise its parcel express, chartered cars and funeral service.

It is not always necessary to mention the railway when advertising for traffic. For example, by arrangement between the city and the San Antonio Traction Company, San Antonio gives concerts at San Pedro Springs while the railway advertises them in the papers. The railway does not mention its own name or trolley service, but this is needless because most of those who go to the concert will have to use the trolley.

Moving Pictures.—Many films contain bits of scenery along electric railways, and it might be well for electric railways to buy appropriate slices from the film companies. The Quebec company was the first to do this, buying reels of the scenery along its interurban.

Utilizing the County Fair.—The Beaver Valley Traction Company, New Brighton, Pa., conducted in 1915 a novel exhibit at the Beaver County Fair to demonstrate to the people of the vicinity that all of the nickels garnered during the days of the fair were not "velvet," and of impressing upon the public the great variety of ways in which it had appealed to them during its campaign for the prevention of accidents. The master mechanic was in charge of the booth to explain the operation of the various mechanical and electrical devices. A complete straight air-brake equipment was in operation so that the intermittent pumping of the air compressor and the occasional shrieks of the air whistle attracted crowds as well as demonstrated some of the inner workings of a car.

One exhibit was a panel which showed the sixteen operations necessary in removing old paint from a car exterior and in applying the successive coats of primer, surfacing, sanding, color, striping and varnishing. On the floor was a platform controller, grid resistors and a motor frame mounted on an axle. The whole was so wired with carbon lamps as to show clearly the path of the current on different points of the controller. Thus the company called attention to the large waste of energy in starting a car with a comfortable rate of acceleration.

The company also demonstrated the details of a controller and the construction of an armature, and exhibited types of overhead line material, car trimmings and lightning arresters, besides showing the daily and yearly coal consumption record painted in yellow on a large block of coal.

The operations of the modern storeroom were shown in novel ways. One board carrying screws was labeled: "Did you ever think—there were so many kinds of screws in one street car?" Storeroom movements were emphasized by the sign hung over a journal brass: "Did you ever think—1½ tons of these brasses in service, length of life only one year?"

An excellent water color of the "Capture of the Essex," one of the commerce raiders of the War of 1812, bearing the legend "Yes, our painter did it," was a tip as to the ability and type of workmen employed. A photograph showing the assemblage at the last Christmas tree and a group of employees' field meet photographs gave the public an insight into employees' welfare work.

To present financial problems a series of rails was mounted on two cross-ties and used to illustrate the difference in cost of construction twenty-five years ago and to-day.

Another sign read as follows:

"Your fare has not increased but—

"Operating expenses 1906 = _____

"Operating expenses 1914 = _____"

A portion of the 1914 expense account was also presented to show cost of maintenance of equipment, of production of power, of wages, of bridge tolls, of insurance premiums, of maintenance of way costs, etc. Thus, the company demonstrated that its tax burden, both state and county, was high—not low.

The "Safety first" exhibit gave a fair idea of the accident-prevention advertising matter used. Further, the company distributed the following: 1000 safety first cards for teamsters bearing at the top a large horse blanket pin; 2500 boxes of safety matches, with warning stickers on each side lettered; 1000 scratch pads with safety advice; 1000 halftone booklets for mothers, the cover bearing a short appeal for safety and the several pages of the booklet depicting as many ways in which accidents might happen; and about 1000 drinking cups, blotters and cards.

The cost of preparing, installing and removing the appliances in the booth was \$46. The cost of advertising matter was \$56.

The Illinois Traction System has long taken an active part in state and county fairs, but chiefly to give timetable information. The company uses a booth flanked by standard block-signal apparatus in action.

Window Map Display.—The Cumberland County Power & Light Company, operating the electric railway service of Portland, Me., and

vicinity, effectively advertises the layout of the system by a map painted in colors on the plate-glass window of the waiting room in Monument Square, Portland. The system extends from Saco to Waterville, and the featuring of the map as a transparency attracts much attention from both inside and outside the waiting room. •

CHAPTER XIII

COMPETITION

The superiority of propulsion on rails was first established when the horse bus gave way to the horse car under conditions exactly alike except that the bus traveled directly on the highway and the car on rails. With the successful application of car propulsion with transmitted energy the bus became all but extinct in America, while its continued tenure abroad was due almost entirely to an aversion to widen narrow streets or to place rails on show thoroughfares.

Motor-bus Competition and Possibilities in Cities.—The development of the motor bus has threatened but little injury to the American city car, because the space required to carry its own generating equipment made it very inefficient in capacity—and capacity, as every traffic man knows, is the prime quality for carrying the largest number of people at the least expense for personnel and with the least amount of street area occupied—an important matter in a crowded thoroughfare.

It is hardly necessary to expatiate on the extremely short life of the bus as compared with the car and on its very costly upkeep. Even the hybrid trackless trolley, though relieved of an engine, has usually found that the burden of tire, maintenance and extra energy requirements is too great to make it a successful competitor of the standard construction.

Briefly stated, the auto-bus has in its favor low investment cost and against it, high operating expenses per seat mile, as compared to the electric car. These conditions mean that over a long route with sparse traffic and very long headways the economical advantage would be in favor of the auto-bus. There are many such cross-country routes where the electric railway, on account of its high initial cost, would not pay, but where an auto-bus line, with fairly high fares, would be profitable. Included among these are lines on which a service is required for part of the year only. On such lines it is obvious that a system with a high initial cost and consequently high fixed charges would be at a disadvantage.

The auto-bus line for city service is a competitor of the electric car and with a 5-ct. fare was never popular in this country until the rise of the jitney in the spring of 1915 when a number of such lines were put in operation in different parts of the country. We shall discuss later in this chapter the series of artificial conditions which added the jitney, or touring car taking passengers for 5 cts., to the existing

means of city transportation. It is sufficient to say here that despite the extended development of the auto-bus in London, there is no reason to believe that if it is burdened with the same conditions of taxation, length of routes and service requirements as the electric railway, it will become a serious competitor to the electric car in congested city service in this country. Its real, but limited field in cities seems to be to supply a service de luxe at a 10-ct. fare on routes where the construction of an electric line is not permitted. A good example is on Fifth Avenue, New York.

Auto-buses Impracticable for City Rush-hour Service.—Still another suggested field for the auto-bus at a 5-ct. fare is an auxiliary to the electric car for the rush-hour service.

The basic thought underlying this suggestion is that cars serving the peak traffic operate under an extremely low daily load factor, and that buses with their lower overhead charges on the extra equipment required for rush-hour service would really cost less than a service increase obtained in the usual way. The falsity in this reasoning is easily shown.

That portion of the railway company's overhead charges which is affected by rush-hour traffic is, in the main, limited to the power house and the cars themselves. The investment in track and overhead line is not increased except where a congested loop in the center of a town sets physical limits upon the number of cars that can be moved. Even under these circumstances the greatest part of the track mileage is never worked at its full capacity, and the investment required for more service is confined to that due to re-routing through the congested section.

On a broad general basis the investment in facilities for power that is required for additional service is say \$3000 per car; and the car itself may be said to be worth \$5000; so that an investment of roughly \$8000 is involved for each new unit, neglecting incidentals like housing, repair facilities and the like. Such a unit will seat between fifty and sixty passengers and will provide standing room in addition. A motor bus of equal capacity appears to be impracticable, and according to present standards two twenty-six- or twenty-eight-passenger buses would have to be considered as the equivalent in seating capacity of a single surface car, although they would have practically no standing capacity. The cost of such buses appears to vary from \$3000 to \$5000 each, or, for the two units assumed (by neglecting standees) to be equivalent to the \$8000 electric railway car, the investment in buses would be between \$6000 and \$10,000.

Obviously the maximum saving in first cost effected by purchasing the cheapest kind of a bus would not warrant its use even for one trip per day in preference to the street car, in view of the fact that its direct

operating cost is more than twice that of the larger unit. We would have then, with two twenty-six- or twenty-eight-passenger buses, no less investment and higher operating expenses. In this comparison it is assumed, of course, that the speeds of the bus and of the electric railway car are the same. In general this will be the case, because the boarding and alighting facilities of a twenty-six-passenger bus are distinctly inferior to those of a fifty-passenger car. Another objection to the proposed plan would be that two radically different types of rolling stock, requiring different repair shop and housing facilities would be required, and two classes of employees would be necessary.

Motor Buses in Cross-country Service.—Reference has been made to the use of the auto-bus in cross-country or interurban service. There are many such lines and some of them act as good feeders for electric railways with which they connect.

One of the most important projects fathered by a railway is the Washington Auto-bus Company, a subsidiary of the Puget Sound Traction, Light & Power Company, which in 1915 began to run auto-buses as feeders of several interurbans. All of the vehicles used are for one-man operation. The chauffeur acts as ticket seller as well as collector. He uses a neck register for the collection of cash fares.

One line is between Auburn and Enumclaw, 22 miles, running at right angles to the Seattle-Tacoma Interurban Railway, making connections at Auburn. Three twelve-passenger cars are used to give the service which is laid out to make connections with the interurban trains. Two-part coupon tickets are sold to cover combination interurban and auto-bus trips, each ticket showing the name of the issuing company. The straight bus fares are practically 3 cts. per mile, whereas the interurban straight railway fare is sometimes as low as 2 cts. per mile, and commutation rates are even less.

SCHEDULE OF RATES FROM SEATTLE

To	Miles	One way	Round trip	Ten rides
Bothell.....	16.0	\$0.45	\$0.75	\$3.00
Kenmore.....	13.0	0.35	0.50	2.00
Lake Forest.....	11.9	0.30	0.40	1.75
Briar Crest.....	10.8	0.25	0.35	1.50
Lake City.....	9.0	0.20	0.30	1.40
Chelsea.....	8.5	0.20	0.30	1.40
O'Briens's.....	8.1	0.15	0.30	1.25
Morningside.....	7.1	0.15	0.25	1.25

A second line with two eleven-passenger cars is operated between Edmonds and Seattle Heights, 3 miles, feeding the Seattle-Everett line

of the Pacific Northwest Traction Company. Connection is made at Seattle Heights. Tickets and rates of fare are on the same plan as the Auburn-Enumclaw line.

On Nov. 15 a service was started between Seattle and Bothell, a distance of 15 miles. Each of the three cars seats twenty passengers. Transfers are issued to and from the company's Seattle lines. The fares are shown on page 344.

The Beginnings of the Jitney.—The plague of electric railways known as the jitney or 5-ct. bus originated at Los Angeles and San Francisco during 1914. At first the operators were skilled mechanics out of work who operated their own machines for hire in lieu of doing nothing at all. To these were soon added a host of adventurers who found no difficulty in buying or hiring cheaply second-hand machines from the vast number that glut the automobile market. The movement developed with amazing rapidity, for practically no laws were in existence to specify the routes, schedules, taxes, fares or responsibility of the jitney privateers. All that the jitney applicant had to pay was the same nominal license fees required of those who did not operate for revenue.

Despite its glaring economic absurdity the jitney made friends at first in every rank of society. For one thing its individual ownership and operation meant a return to individualism, and so met with the encouragement of a public which is ever permitting sentiment to get the better of sense. From the very beginning of the jitney service, the most dangerous overcrowding on the flimsy and exposed vehicles was in vogue and tolerated as a joke despite the jitney cry of "No Strap-hanging." Well, that statement was true literally at least.

A second powerful influence behind the jitney development was that of the automobile interests from the manufacturer to the repairman and gasoline merchant. The manufacturers and their agents saw in the jitney a golden opportunity to get rid of second-hand machines, while the supply men naturally had no objection to such an enormous enlargement of their market.

Thirdly, the opposition offered in many cities to ordinances demanding little more than a suitable indemnity bond showed that the politician has a healthy fear of organizations made up of several hundreds or even thousands of men whose living depends on remaining a danger to or a burden on the community.

Last but not least was the publicity which the jitney received as a news feature. Hardly had it appeared on the scene than the local newspapers used it for all sorts of quips against the street railway, and some offered prizes for the most amusing verses—laudatory or otherwise.

To cap the climax a press syndicate flooded the country with stories of mythical jitney profits, and suggested that the newspapers help to

introduce them at home to "kill the street car corporations and their rotten service."

Transportation Objections to the Jitney.—There are many reasons why an automobile with a touring car body is not a suitable vehicle for city transportation service such as that supplied by an electric car. We shall mention a few, beginning with the standpoint of the passenger. The touring car body was not built for the transportation of more than a few passengers so it is not as sanitary or as safe when overloaded as an electric car. It is difficult to light the car satisfactorily at night and passengers have not got the protection of a conductor, conditions which militate against its use during all hours of the twenty-four. The car cannot easily be heated in winter and it is not well suited to stormy weather. From the standpoint of the city, the space taken on the streets per passenger carried as compared with the electric car is an important objection to any kind of automobile transportation agency.

These objections apply to the character of conveyance and do not relate to the conditions of operation. Actually, the jitney lines which sprang up during 1915 flourished because they did not accept the obligations which the experience of years with common carriers has shown are necessary for the protection of the public. While many of the jitneys operated over definite routes, these routes were so selected as to take the cream of the business, leaving the unprofitable part to the railway. Practically none of the jitneys assumed any responsibility for continuous service. During the unprofitable hours, or on days of severe storm, or when the jitney driver or drivers had something more profitable to do, they would stop. The driver was often the owner and practically always of small financial resources so that in case of accident to passenger or pedestrian through careless operation there was little chance that the injured person could collect damages.

It is doubtful whether jitney operation could be made profitable even under the conditions just mentioned. It certainly could not be made to pay if the operators were obliged to give such guarantees of financial responsibility, continuity of service, etc., as demanded, and properly, of the electric railway.

Economics of Jitney Operation.—Various figures have been given for the cost of jitney operation, but they have varied greatly, just as do the costs of operation of private automobiles. The following data have been compiled by L. R. Nash, of Stone and Webster, Boston, and may be considered representative of average conditions. They were presented by him in a lecture to the students in the graduate school of business, Harvard University in the early part of 1916.

According to Mr. Nash, the earnings per jitney-mile lie ordinarily between 4 and 6 cts. One of the large distributors of Ford cars has

estimated that the operating expenses and upkeep of its touring cars in jitney service should be 3.4 cts. per car-mile excluding interest, taxes, insurance, housing and drivers' wages. Other conservative estimates of total cost of service, however, including the items omitted in the above estimate, lie between 5 and 7 cts. per car-mile for Fords, between 10 and 15 cts. for heavier cars and about 25 cts. for large buses.

Mr. Nash then said that he had been able to secure some previously unpublished data in regard to the actual cost of operating a Ford touring car in jitney service for nearly one year under particularly favorable circumstances. The owner, who also drove the car, was a good mechanic, doing practically all his repair work, and through unusual skill in driving and good business judgment in selecting his field he obtained much better results than could be expected from the average unskilled and careless operator. Some of the results of operation of this particular machine, carried out for the full calendar year 1915, are as follows:

Days operated.....	347
Hours operated per day.....	15.3
Miles operated per day.....	245
Schedule speed, miles per hour.....	16.0
Length of one-way trip (miles).....	4.0
Car-miles per gallon of gasoline.....	20.5
Car-miles per gallon of oil.....	128
Average cost of gasoline per gallon (cents).....	13.2
Tire-miles, per tire.....	12,000
Total annual mileage, approximately.....	85,000

Mr. Nash said that the foregoing figures were more favorable than those usually reported, those for daily mileage and tire life being particularly so. The length of trip is not so favorable, being rather long for jitney service, but it was presumably selected because of its steady patronage and good pavement.

The operating expenses of this car on a mileage basis were as follows:

Expenses per mile (cents):	
Gasoline.....	0.65
Oil.....	0.11
Tires.....	0.50
Repair bill and material.....	0.56
Owners' repair time at garage rates.....	0.73
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Total repairs and renewals.....	1.29
Operating labor, estimated at 25 cts. per hour.....	1.56
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Total expense.....	4.11
Licenses, bond, taxes at interest.....	0.35
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Total expenses and charges.....	4.46
Total gross earnings per mile (cents).....	4.06
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Deficit.....	0.40

The gross earnings per day of this car averaged slightly less than \$10, and a total cost of service, assuming wages at 25 cts. an hour, was nearly \$11. It is estimated that, to wipe out the deficit the range of operation should be reduced from 4 miles to about 3.6 miles, assuming a constant expense per mile and the uniform 5-ct. fare. Mr. Nash notes that no accident cost was reported for the entire period, a situation which would not continue indefinitely with the best of operators. A further study of the operation of the machine which involved the assistance of a helper at 20 cts. per hour, shows that with this payment the owner actually made only 17.4 cts. per hour for his own operating time, which averaged 8.9 hr. per day. He therefore earned from operation \$44.50 per month or about \$1.50 per day. Including his time spent on repairs at garage rates, his total earnings were \$96 per month. As a driver the owner did a full average day's work at common laborer's pay, and he worked extra hours at his trade as mechanic on the repair work and made a good living, but less than he could have made in good times at his regular work at \$4 per day in regular hours only. If he had not been a good mechanic he could have done only a part of his repair work, and his earnings would have been reduced to that extent.

The Ford car used in this case had been driven 38,000 miles before it started in the jitney service. Before the end of its jitney year all important parts had been renewed, so that the owner estimated an indefinite life under repair expenditures at the rate actually made. This is the reason that no depreciation allowance is made in the figures given above. Other makes of cars could not be renewed as readily and the cost would be much greater.

In view of the favorable conditions under which this Ford operated, Mr. Nash concluded that the showing for the financial success of the jitney under ordinary conditions is not encouraging. In general it has been estimated that electric railway service costs about 0.7 ct. per seat-mile and that jitney service costs about two-and-a-half times as much. If the jitney as an investment is to be at least equally attractive with the electric railway, which is not considered particularly profitable, it must in some way offset this difference of 250 per cent. in cost of service. If it can travel twice as fast as the street car its earnings per seat-mile, other things being equal, will be double, leaving the margin of difference between the street car and the jitney only 25 per cent. If everything else remains equal except the haul, this must for equal profit be less to the extent of this 25 per cent. for the jitney than for the street car. Actual experience seems to indicate that there is at least this difference under average conditions. According to Mr. Nash, it should be clear from the figures given that light cars of the Ford type are more successful than any others, and in fact are probably the only ones which have paid their way

under normal conditions. The operating expenses and maintenance of the heavy cars and large buses are too great for successful competition with electric railways. He sums up the financial situation by saying that 3 miles or less is the usual limit for profitable operation of jitneys of the most economical type, and under good pavement and traffic conditions.

In discussing the future field of activity for jitney operation, Mr. Nash stated that communities must make up their mind that they cannot have a short-haul jitney and a long-haul street car both at a 5-ct. fare. If the short-haul riders demand jitney service and the demand is granted, the long-haul riders must pay increased street-railway fare, possibly double. Moreover, many questions arise as to how the operation of jitneys could be controlled even in the short-haul field. In Mr. Nash's opinion, the only logical solution would be to issue a blanket license to a responsible concern to furnish all the jitneys in the city, or a particular section of it, presumably with transfer privileges. This plan would provide definite responsibility, a means of enforcing regularity of service and sufficient assets to cover accident liability. Company operation of jitneys, however, has been tried on a rather small scale and it failed, and the universal experience thus far has been that administration and higher wages ate up all the profits which individual owners might possibly have made.

In general, therefore, Mr. Nash believes that under strict, adequate regulation and protection to patrons, the jitney as an individual venture will have great difficulty in surviving in good times. As an organized independent business, it has no economic excuse for existence. In either case, it is a cause of traffic congestion and an added danger to necessary users of the streets, and should be eliminated or restricted to a field which cannot yet be definitely foreseen. As to possible future useful and profitable fields, the suggestion is offered that jitneys might be employed by electric railways in comparatively undeveloped sections as feeders to street car lines. Their relatively small cost and low operating expense per car-mile might adapt them for pioneer temporary use, until sufficient traffic developed to justify track extensions. Moreover, instead of using the usual small gasoline car for this purpose, an electric jitney might be developed along the lines of the so-called "trackless trolley" which has been operated to a limited extent abroad. This would involve a comparatively small investment per passenger, with the high power efficiency of the central station instead of the relatively low efficiency of a small gasoline engine. In some such service as this, the jitney in a modified form might find a permanent usefulness.

Trial of Jitneys by Railway.—The Virginia Railway & Power Company which operates the Richmond railways, in order to test the profitable-

ness of jitney service began operating forty five-passenger cars in April, 1915, under the name of the Motor Transit Corporation. In September, 1915, the service was discontinued because it was losing money, and the buses were auctioned off at \$216 each. In the meantime many independent operators retired for the same reason. The Richmond company's costs follow:

STATEMENT OF RICHMOND JITNEY OPERATION, APR. 17, 1915, TO SEPT. 14, 1915

Gross earnings.....		\$30,501.28
Taxes.....	\$671.00	
Operation.....	24,043.79	
Maintenance.....	9,758.70	
General expense.....	1,856.77	\$36,330.26
Deficit.....		\$5,828.98
Bus-hours operated.....	62,080	
Earnings per bus-hour.....	\$0.491	
Expenses per bus-hour.....	\$0.585	
Loss per bus-hour.....	\$0.094	

As will be noticed, the earnings per bus-hour were less than the operating expenses, not including depreciation or rent for the garage. The company first undertook to keep a record of its expenses on the bus-mile basis but had to abandon this plan on account of numerous errors in the mileage recorders, so that the statement was prepared on the bus-hour basis. The average miles per hour made by the buses were approximately 12 miles. The company owned the garage where the buses were stored, and in the statement given above no allowance is made for the rent of the garage. No attempt was made to estimate the depreciation on the buses, but the company found "it was very great for the short time they were operated." The buses used were five-passenger touring cars of the usual kind. Part of them were Fords and the others Briscoes.

Arguments Against the Jitney.—The first of the able documents pointing out the menace of the jitney is found in a message sent by Mayor Rose to the Los Angeles Council on Dec. 23, 1914. The mayor contended that the use of the streets by the jitney buses was an additional burden not contemplated in the original dedication of the city streets and that the city had the indubitable right to regulate and restrict this form of traffic. He reviewed the tremendous growth of the business and pointed to the official police records to prove the increase in accidents recently. In this connection figures were cited to prove that the 5-ct. buses had been involved in 22 per cent. of the personal injury mishaps reported to the authorities. The mayor suggested that only drivers of proved ability should be licensed to enter the business district. In addition to this he

¹ Expenses do not include any charges for depreciation or for rent of garage.

would require definite routes and station stops. Referring to the effect of the jitney buses on street railway transportation, he said:

"Assuming that the 700-odd auto-buses operating in Los Angeles are averaging \$3 a day in fares, we have a total of \$2100, or about \$60,000 a month, subtracted from the earnings of the street railways. How does this affect the public? As is well known, the street railroads operate under franchises which entail heavy expense for street maintenance, taxes and public improvements. It is estimated that the street railways maintain at least one-third of the streets along which their tracks run, at a cost to them of upward of \$350,000 a year. In addition, they have to bear their proportion of special assessments for street openings and for condemnation of lands for parks and other public purposes, for which their occupancy of contiguous streets renders them liable. * * * Besides this impost they must pay their regular taxes in support of the government, amounting to about 5 cts. on the dollar.

"One of the executive officers of the Los Angeles Railway is authority for the statement that for every nickel collected in fares more than 3 cts. is expended directly for labor in this city. Of the remaining 2 cts. at least 1 ct. goes for taxes, license, street improvements and material, or four-fifths of the whole is returned whence it came, to benefit the people of Los Angeles. The remaining fifth takes care of the interest charges on the bonded indebtedness, and as many of the bonds are owned in California, a share of this last fifth also remains here.

"In contrast to this showing is the 5-ct. fare paid over to the jitney bus driver. Four-fifths of this sum must go for gasoline, oil, rubber tires and to pay for the machines, for few of them are owned outright by the men operating them. It is a direct reversal of conditions. In the latter case 4 cts. in 5 goes out of the city; in so far as the street cars are concerned, that same proportion in the nickel stays here.

"I am thus explicit because I wish to show our people the partnership interest created by the franchise regulations that bind the street railways to certain specific obligations, directly benefiting the public, as opposed to the non-regulated auto-buses, having no such onerous liabilities imposed upon them. It is patent that if the street railways are losing what will amount to \$750,000 a year, the public service heretofore furnished by the street railways will be curtailed to comport with these new conditions.

"The people in the end will be compelled to depend upon the street railways for transportation. Meanwhile, the loss of revenues has affected the whole city as shown. Extensions have been necessarily blocked and the enforced economies have been reflected in a hundred different directions beyond the street railways themselves.

"To dally longer in our present state of irresolution and inaction as regards the jitney bus is to be guilty of gross injustice to the people."

In a statement made public on Jan. 10, 1915, Mayor Rose said:

"One other important item is the necessity for fixed responsibility in case of accidents; not less than \$10,000 for each auto-bus operated should be demanded for the full protection of the public. Overloading should be strictly prohibited."

The railway companies were also not slow in calling the attention of the public and particularly of the authorities not only to the unfairness of the competition to which they were subjected but to the unsuitableness of the jitney to general city passenger service.

Thus the Portland (Ore.) Railway, Light, Heat & Power Company

issued in February, 1915, two able documents, one showing in part what the effect of the unrestrained jitney would mean to the platform men, and the other bringing out the taxes paid by the company to the city. It was shown that the company had contributed during the preceding year a total of more than \$550,000, equivalent to 18 per cent. of its gross revenue. In addition, policemen, firemen and other city employees enjoyed more than 750,000 free rides which, if paid for at the usual ticket rates, would have cost the city about \$33,750. Letter carriers and various county employees were being carried for less than cost. The company also called attention to the moral side of the question as follows:

"In some of the California cities the serious menace of the jitneys from the standpoint of morality aroused the women of those cities to take urgent action to safeguard girls and young children against the evils, particularly from the absence of stated routes and lack of lighting. Numerous items in the press cite instances of insult and mistreatment to girls in crowded jitneys. In Los Angeles, fake jitneys actually were held responsible for the disappearance of several young women, while in Berkeley two co-eds narrowly escaped such experience."

Other companies offered similar arguments. The labor unions also generally, but particularly the railway unions, saw the danger of their street railway members being forced out of employment and passed resolutions expressing themselves as opposed to the jitneys.

Growth of Jitney Regulation.—Gradually the necessity of regulation for this new type of common carrier became manifest. This has taken the form in some cases of municipal regulation and in other cases of state regulation.

Municipal regulation has required license fees, bonds to secure the payment for damages caused by negligence, special examinations for operators, fixed routes, definite hours of service, inspection of cars to insure good condition, restrictions on overcrowding, etc. Under State regulation the jitneys and auto-bus lines have usually been put under the jurisdiction of the State Public Service Commission.

With these laws the danger of the unregulated jitney passed. At one time it threatened to affect greatly the financial condition of the electric railways. But fortunately for them the equally as large if not greater danger to the public soon became apparent, and the only logical solution, strict regulation, followed.

Inroads by Private Automobiles on City Travel.—The effect of the cheap automobile in the form of the jitney has been described. We shall now discuss the effect on electric railways, particularly on urban roads, of the private automobiles which have increased so greatly in numbers during the recent years.

Of course, if only the owner of the automobile rode to business its influence on the receipts of the trolley company would be small. But in

a city of moderate size where the owner in a spirit of generosity and hospitality invites his next-door neighbor to take a seat in his car and extends this invitation as well to his other friends until the car is full, the total effect of a large number of cars is considerable. This truth is brought out with startling clearness by the traffic figures presented in August, 1915, by the Denver Tramways. The investigation showed that on a typical weekday, Tuesday, May 11, 1915, passenger automobiles alone carried 7.8 per cent. of all the traffic going by certain points in the business district. Furthermore, motorcycles and bicycles carried 5.8 per cent., horse-drawn vehicles, 1.2 per cent., freight vehicles, 7.3 per cent., and pedestrians constituted 27 per cent. This leaves 50.9 per cent. to the street railway.

This figure is a lower proportion of the total travel than one would expect in most cities of greater size or even in those of equal size. In the large Eastern cities, for example, the bicycle and motorcycle are practically unknown for business uses; furthermore, in large cities the distance from the residential to the business district is too great for walking by so large a percentage as that found in Denver. But even if the influence of the passenger automobile alone (46,525 riders a day) is considered, its business in possible 5-ct. fares is equivalent to \$2,326.25 a day—a very tidy sum to add to the gross earnings of any company. The company figured that each of Denver's 5580 automobiles averaged 8.35 passengers per diem.

It is likely that prosperous Denver, with its wide, level streets and non-congested residential districts, has more than the usual number of automobiles. Still the time is not far away when many other cities may have the same or an even greater percentage of automobile traffic. When machines can be bought for only \$360 each, the only factors that seem capable of impeding their extension to a point that would seriously impair street railway earnings are garage rentals, street spacing for safe travel and the price of fuel.

Despite these discouraging figures, there is no reason to suppose that the great mass of the population can ever afford to use anything costlier than the electric railway. Moreover, the ultimate effect of the cheap private automobile should be beneficial to the electric railway in that it tends to encourage the owner to live in the suburbs, and while he may usually ride to and from business his automobile or automobiles cannot always be at his service or at that of the members of his family or of his servants, and they will have to use the electric cars.

Interurban Competition from Automobiles.—The inroads of the private automobile are probably more serious in their effects on the interurban railway than the city railway, for few city people can afford a garage rental even if they can afford the machine. But the man of the

farm or the country town has space galore. Many of the social or pleasure trips that were made weekly via the interurban are now made by automobile, with two or three neighbors as guests. Farmers who raise garden truck are also tempted to use the automobile when it can be used to convey their produce as well as themselves.

Perhaps the most conspicuous evidence of the large number of automobiles now in use in the country districts is shown at different county fairs. In the past most of the attendants from a distance to the average county fair came by the electric cars. Now anyone who attends such a fair is impressed by the large number of automobiles parked near the grounds. In the case of one county fair held in October, 1914, it was found that the attendance was considerably greater than in 1913, but the receipts of the electric railway companies operating cars to the park were less by between 25 and 40 per cent. In another case the railway company reported a decrease of \$9000 between 1914 and 1913, and it was roughly estimated that at least two-thirds of the decrease was due to automobile travel.

As to what can be done to meet this new form of competition, the most obvious procedure (and apparently the only one) is to explain the facts to the public. The automobile offers the one great advantage of convenience, although limited to pleasant weather, but to offset this the interurban offers speed and cheapness. Between towns an electric car ought easily to outrun a motor car in the hands of anyone but an expert or a lunatic, and for the light, cheap cars so generally sold in rural districts a speed of 30 m.p.h. is about the maximum under any circumstances. In the matter of cost, even the light automobiles will average some 6 cts. per mile, at least, against the 1.5 cts. or 2 cts. charged on the interurban. If the farmer realized this, as he could be made to do by a small amount of comparative cost publicity consistently and continuously applied, it seems reasonable to expect that, after the novelty of the automobile has worn off, it will cease to be a serious competitor.

Finally the same consolation obtains with the interurban railway as with the city railway. Undoubtedly the interurban manager will find that travel begets travel and that the conveniences of the automobile will cause many people to reside in the country, a fact which should ultimately be of benefit to the interurban electric railway in both its passenger and freight business.

CHAPTER XIV

FREIGHT AND EXPRESS BUSINESS

The subject of freight rates, express rates and the like is so large and complex in itself that it will not be considered in detail in the following discussion on the development of non-passenger traffic.

Ruinous Rates Hinder Steam Co-operation.—In the early days of interurban railroading many electric railways made the mistake of cutting steam railroad and old-line express rates to a ruinous degree, instead of depending upon quicker service at the old rates. In fact, they allowed the public to imagine that electricity made freight handling miraculously cheap. By this policy they incurred the just dislike of the steam railroads and so lost the advantage of freight interchange and car exchange privileges. To-day the electric railways which are on friendly terms with the steam railroads are usually also those who can show that the non-passenger travel is really handled at a profit. On the Pacific Electric Railways lines, for example, the introduction of a liberal freight interchange agreement and the application of through rates from all stations increased the freight business by 22 per cent. in one year.

Steam and electric lines are not properly competitors. The electric line reaches the farmer's very door and encourages an intensive cultivation that eventually brings more business to both classes of roads. If the special advantages of each are utilized to the fullest extent in any particular territory, both steam and electric lines, as well as the public, will profit. Electric railways have done much in States like California and Michigan to give fruit and produce growers a far greater market than in the days of slow wagon hauls to the distant steam railroad.

Through Electric Operation.—It may be pointed out also that long through all-electric runs are becoming more common daily. Through tariffs are in effect in nearly all the territory (Ohio, Indiana, Michigan, Kentucky, and Illinois) of the Central Electric Traffic Association. One is the through freight run of 200 miles between Benton Harbor, Mich., and Indianapolis, Ind. This run is made from 5 p.m. to 7 a.m. the next day over four different roads. During this long run freight is also distributed and transferred at wayside points. Significantly enough this "freight" train serves as the "express" carrier of an old-line express company.

Difference in Steam and Electric Freight.—As early as 1908 a speaker before the American Electric Railway Transportation & Traffic Association

pointed out that the cost of handling freight depended largely on the magnitude of the business and train units. Steam railroads can move freight at a cost of a few mills per ton-mile while it costs electric railways from 1 to 10 cts. per ton-mile to move freight in an ordinary motor car. This cost can be lowered somewhat by having a motor car or locomotive with trailers especially designed for a freight service which is faster than steam freight but slower than steam passenger trains. The express-freight car is especially desirable for electric railways since it combines the power to haul eight to ten cars with the high speed and individual capacity required for perishable freight.

If the small electric railway would add to its receipts by the handling of freight, it must break away from the steam railroad classification and steam railroad rates. It must study the community served and must make a tariff which will attract to the service such a class of freight as can pay a fairly large charge for quick and convenient transportation. The low classes of freight, with very few exceptions, are not to be considered, especially if the cars are to come back empty as is the case with isolated lines. The higher classes of freight and those requiring quick transportation can be and are being made the source of good profit to electric railways. Freight should preferably be moved at night when the power equipment would otherwise be practically idle or when the railway can get a lower rate for purchased energy. Then, too, the line is free of passenger trains and no interferences with the passenger service occur.

It is a most attractive feature of interurban freight service that the customer can often be saved the cost of drayage to and from a freight house. The drawbacks to the railway, of course, are that day cars engaged in loading or unloading freight in the towns may block the main line to the detriment of the passenger service. Sometimes, too, when such freight cars clear the main line for passenger trains, it is necessary to make a round trip to some switch track before loading or unloading can be completed. This has been found to result in numerous errors through improper checking, and if no receipts are taken for shipments delivered in this manner, claims for loss cannot be settled on a business basis. For these reasons, electric railways have been led to establish responsible agencies for the checking and delivery of all shipments.

One handicap to the through carriage of freight over electric interurbans is that many such roads pass through the streets of cities. It is usually necessary to seek special legislation, such as the Cleveland ordinance of Dec. 9, 1912, which permits freight to be handled over the streets between 10 p.m. and 3 a.m. If the amount of business conducted is considerable, special freight and express stations, especially in the terminal cities are desirable. Freight cut-offs around some of the

intermediate cities can also often be introduced to advantage in the haulage of through freight, as on the Illinois Traction System.

The Menace of the Auto Truck.—In spite of sad experiences with direct delivery, there is a most excellent reason why the electric railway should exploit its front- or back-door connections to the utmost—and that reason is the auto truck.

Of course, an auto truck cannot move material as cheaply as an electric car; but while its cost of moving the material is more its cost of handling the material may be much less. To illustrate: when a man ships by auto truck, there is but one loading at the shipping end and another at the receiving end. Compare this with the possible movement of the same material if transported over a railway with regular freight stations, namely:

First.—From shipper to shipping truck.

Second.—From truck to freight house.

Third.—From freight house to car.

Fourth.—From car to second freight house.

Fifth.—From second freight house to delivery truck.

Sixth.—From delivery truck to consignee.

Thus we have six handlings against two; and even if the material is put in and removed from the cars direct without using the freight house the number of handlings is still double that of the auto truck.

On runs of say less than 50 miles the cost of handling is a factor to be reckoned with. Therefore, if the short-line interurban gives up direct service it will eventually lose practically all high-tariff business. The initial failures of early auto-truck operators should not lull the electric-freight operator to sleep. Auto trucks and highways are constantly improving, while those who enter the field later will have the experience of the pioneers to save them from pitfalls.

In any event, the auto-truck company has no hesitation in permitting the driver to give and take receipts for goods; and the electric railway will have to train or secure men of equal reliability.

The blocking of passenger trains is a more serious question than that of receipting. Here a careful study must be made to equip the rolling stock with the quickest possible loading arrangements, such as wide doors, runways, shelving, etc.; and to transact as much business as possible during off-peak hours. Thus alive to the possibilities of the auto truck, the railway will not only be able to hold all business contiguous to its tracks but may even consider operating its own auto trucks for the rest of the custom.

Still another plan is for the electric railway company to provide gondola cars on which highway vehicles can be mounted. These highway vehicles collect the freight which is distant from the railway, are

hauled on the gondola cars to the terminal city and then take the freight to its destination. In this way all transshipment is avoided. One or two attempts have been made to develop business along these lines but they were abandoned, the reason probably being the crudeness of the equipment employed.

Failures of Auto Freight Service.—While we have stated that early auto-truck failures are no criterion for the future, it is instructive to read why the jitney freight business of southern California—one of the most ambitious projects of 1914–1915—blew its tires so quickly.

At one time dozens of individual truck owners were ready to carry freight for more than a hundred miles practically at railroad rates. After a few months two difficulties developed.

The first came when inexperienced and short-sighted private owners began to find that overhead and depreciation on their machines more than ate up their net receipts for handling freight. The second developed in the form of opposition from jobbers and manufacturers who were unwilling to trust valuable merchandise to irresponsible and unknown parties, who in the event of loss and damage could offer no guarantee. In an effort to obviate these difficulties a well-financed company was organized. This company bought fifty or sixty auto trucks and the opinion seemed to be general that these modern machines could be operated over southern California's wonderful system of paved roads at a profit, despite the keen competition of the steam and electric lines. The company also put up a bond for the protection of jobbers against the loss of their merchandise, thus overcoming in a measure the second objection. At first they covered nearly all points but slowly cut down until by October, 1915, only a few of the larger near-by towns were served. Apparently, the business did not prove profitable. When asked why the automobile truck apparently had proved impracticable in the interurban handling of merchandise here, a Los Angeles jobber said:

"The rail lines have all the advantage. We may dream all we want to about competing with them, but they can handle merchandise for a great deal less money than can the auto truck. The life of a box car, they tell me, is more than twenty years. It costs \$1400 against \$3000 or \$4000 for a good auto truck, and yet has four or five times the capacity. An auto truck is junk in three or four years. Another reason is that somehow the merchant expects more of the truckman than he does of the railroad. He will go to the station with his own wagon and pick up freight without the least question, but if he orders it sent by auto truck he expects it delivered on his sidewalk without additional expense. Thus the auto people give more for the money than the railroads. Another trouble is breakage. Despite the greatest care, you will find that the percentage of breakage and loss on auto trucks is materially larger than over the same mileage by rail. The railroads have the advantage of fifty years of evolved system in handling goods, and this tells in the final analysis."

Those who have advocated interurban trucking at Los Angeles ex-

press the keenest disappointment that it seems to be a failure. They say that if it cannot succeed there under present conditions it certainly cannot succeed any place else. They point out that nowhere in the world are roads and climatic conditions better than in southern California for such a test. They further point out that the experiment has been well financed and the equipment has been of the highest order.

Another failure on a large scale is noted in the Benton Harbor fruit-growing districts of Michigan. Upon the completion of macadamized roads many large growers, especially those distant from the interurban, began to use trucks. It was found, however, that the fruit was seriously damaged by unavoidable jolting. Consequently, there has been a wide return to the interurban car where possible or to the old-style berry schooner.

The desire of farmers to reach the market speedily has not encouraged in this country the use of motor truck and trailers (caterpillar trains) so popular abroad.

Pick-up Services, Co-operative Express Companies, Through Service.

—One rock upon which electric non-passenger service has split in several communities has been that of wagon delivery, especially for express matter. When a railway undertakes to handle freight and express in rail cars only it improves the use-factor of its right-of-way at slight additional expense. But when it enters the field of pick-up service it enters a field already served by others and one that must prove a great burden if the men and vehicles are not worked at a good load factor.

Co-operative express companies have been formed in territories whose cities are served by several railways. For example, the Hudson Valley Railway and United Traction Company of Albany formerly operated their own express and freight-wagon service and the Schenectady Railway operated the electric express as independent service. In February, 1909, the three railways consolidated under the name of the Electric Express. Eventually the wagon collect and delivery service at Albany was discontinued because it was losing money. Shipments fell off slightly at first, but gradually increased again, and the business which formerly showed a deficit began to show a profit. The Electric Package Agency of Cleveland is a still larger concern of the kind. It is owned by the electric railway companies in and around Cleveland.

As to individual companies, the best policy usually is to make a contract with local teamsters or old-line express companies, depending upon the class of matter. In the latter case, the railway is not only released from a burdensome wagon service, but it also receives pay for express matter originating elsewhere. As an instance, on Dec. 1, 1913, the Aurora, Elgin & Chicago Railroad inaugurated a pick-up and delivery service in Chicago, Ill., through an arrangement with an independent transfer

company. This transfer company will receive and deliver non-perishable and less-than-carload shipments at its own warehouses, which are centrally located in the Chicago business district. Under this arrangement outbound freight is received during the usual freight-house hours and promptly forwarded to destination, and inbound freight will be delivered to consignees at the same station.

This additional service gives the merchants and manufactures along the line of the railroad extra freight service at reasonable rates, and at the same time extends the freight service from the freight house at Fifty-second Avenue to the downtown district of Chicago. Non-perishable and less-than-carload shipments are received by the transfer company at a distribution and handling charge of 5 cts. per 100 lb., with a minimum charge of 25 cts., while miscellaneous shipments are handled at 5 cts. per 100 lb., minimum 35 cts. This charge is made by the transfer company in addition to the freight charge applied by the Aurora, Elgin & Chicago Railroad.

The Pacific Electric Railway, Los Angeles, Cal., has an arrangement with Wells Fargo & Company which allows that company to operate over the entire system, even into and out of what might be called rural districts and under which through rates are applied to and from all Pacific Electric Railway points the same as to and from all steam railroad points on roads operated by regular express companies. Where patrons had formerly to pay the rate to and from Los Angeles, plus the local express rate between Los Angeles and the destination or shipping point on the Pacific Electric Railway, they now pay only the one rate between the points of origin and destination, in most instances saving entirely what was formerly the electric railroad's local express rate. Notwithstanding this saving to the shipper, the electric railroad derives more net revenue from the express business than it did under its local rates and handling. In addition to handling the express business in straight express cars with messengers over lines supporting heavier express traffic, a large amount of this business is handled in connection with passenger service in the express compartment of combination express-passenger cars.

The express contract of one eastern road with the Wells Fargo Company permits it to handle the express matter of that company and the Adams Express Company in any car whatsoever. This probably is due to the fact that the route length of the line is less than 30 miles and a half-hourly service is given during most of the day. The company gets 45 per cent. of the gross revenue from express matter emanating from the line and a proportion of outside business depending upon the proportion of the railway mileage to the total mileage. A Southern company is paid by the Southern Express Company on a different basis, a flat rate per package being received according to its weight. Of course, the parcels

post business has introduced chaos into the whole question of express service, and those railways which refrained from the delivery service have cause for self-congratulation.

Pick-up and Non-pick-up Rates at Milwaukee.—The Milwaukee Electric Railway & Light Company's tariff on package express provides for the addition of 20 per cent. to the scheduled rates for all shipments where collection and delivery are made by the company. All shipments have been divided into two classes, one of which includes the collection and delivery service, but does not provide a time limit for collection, transportation and delivery by the company, and constitutes Class A shipments. All shipments forwarded which do not include collection and delivery nor a time limit for collection, transportation and delivery by the company make up Class B shipments. The railway collects and delivers all Class A shipments within the free mail delivery limits of eight cities and villages along its lines.

The lines selected to inaugurate this package express service traverse a territory not served by steam roads, hence it was possible to calculate the rates on a 15-mile zone basis. For instance, shipment of a 1-lb. Class A package, without the 20 per cent. added to the rate for collection and delivery service, is made within this first 15-mile zone for 21 cts. The charge for a Class B shipment for the same haul is 20 cts. A 100-lb. Class A shipment carries a rate of 40 cts. for the first zone, and a Class B shipment is carried anywhere in the first zone for 25 cts. Shipments to the second zone are made for 21 cts. and 20 cts. respectively for a 1-lb. package of Class A and Class B, and 45 cts. and 28 cts. respectively for 100-lb. shipments of the two classes.

Handling United States Mail.—It is doubtful whether a majority vote of railway mail carriers would endorse the present pay as remunerative. In fact the American Electric Railway Association has had for years a committee on railway mail pay which has toiled with commendable persistence for more liberal pay. Some companies, like the Connecticut Company in 1914, have even refused to continue mail carriage. The whole question is still in such an uncertain state that until a general raise in rates is obtained, mail carriage offers a doubtful profit. In 1916 the rate of pay, which has been the same as for a number of years, was 1 ct. per car-mile for each linear foot of car space devoted to postal uses, for apartment cars, and the following rates per car-mile for closed pouch service.

	Per annum
For 2000 miles or less.....	\$150
For more than 2000 miles and less than 3500 miles.....	175
For more than 3500 miles and less than 5000 miles.....	200
For more than 5000 miles and less than 8300 miles.....	250
In excess of 8300 miles, 3 cents per car-mile run.	

Newspaper Transportation.—In the bad old days many railways thought no more of charging for carrying newspapers than for hauling a politician. The times have changed and one finds that here is a form of revenue relatively small but all velvet. There is no reason why electric railways should not get a good bit of morning newspaper business even in cities.

The morning newspapers of large cities are usually issued in two editions—country and city. Sometimes, too, special editions are gotten out for large suburbs, as the New Jersey edition of the New York papers. As a rule the morning editions come out in ample time for distribution, via cars. Evening papers, however, go to press at more frequent intervals and their publishers will rush automobiles out at top speed for the sake of telling first how the fateful ninth inning ended. This state of affairs is well enough, for in the early morning the outbound cars are empty whereas in the evening they are loaded. So the only evening newspapers that a city railway may expect to handle are the kind that leave the pressroom about breakfast time. Interurban companies can usually secure both the morning and evening business as automobile transportation would be too costly.

The Aurora, Elgin & Chicago Railway operates out of Chicago at 3.30 a.m. a newspaper train which reaches Fox River 41 miles distant in 70 min. Payment is made according to weight. Because of this fast service the interurban public gets the city instead of the county edition. This difference is much appreciated by those familiar with the plan of using fillers in the first edition until news comes along to eliminate them.

In January, 1911, the New York State Railways—Rochester Lines—filed with the Public Service Commission of the Second District of New York its regulations covering the transportation of newspapers on passenger cars. Newspapers in bundles may be carried on the date of issue, or in the case of afternoon papers, during the forenoon of the following day, in the front vestibule of all scheduled passenger cars at 25 cts. for 100 lb. The publishers or agents must deliver the papers to the cars at specified corners, and tender to the motorman a shipping order of a form approved by the general passenger agent; the shipping order shows the number of bundles loaded on any one car, together with total weights. Newspapers are not received for transportation between 6.30 a.m. and 8.00 a.m. and between 5.00 p.m. and 6.30 p.m. The Public Service Commission of the First District also forbids rush-hour transportation of newspapers.

On the Detroit United Railway newspapers on the suburban lines are handled within a radius of 50 miles of Detroit. No newspapers are handled on city cars and they are carried only on express and local sub-

urban cars. An effort is made to confine the newspaper handling to the express-car equipment, but at certain times of the day newspapers must be carried on local passenger cars because of the need for fast transportation. The newspaper publishers club together, and on every Sunday morning charter four special cars to distribute their large Sunday edi-



FIG. 109.—Way station for receipt of milk.

tions over four separate branches of the Detroit United system. Within the city of Detroit newspapers are distributed by automobiles.



FIG. 110.—Way station for receipt of milk.

Milk Transportation.—The transportation of milk is another good early morning business for electric railways. Ordinary box cars usually serve for the work, although the Philadelphia Rapid Transit Company built a special car for this purpose some years ago. Payment is usually made in advance by the purchase of double-coupon shipping tags which

cover going and return trips. The milk train service of the Detroit United Railway extends more than 30 miles, and other interurbans do as well or better. On the interurban lines of the Milwaukee Electric Railway & Light Company the rates vary from 7 cts. for a 5-gal. can for a 5-mile haul to 11 cts. for a 5-gal. can for 40 miles. The rate on a 10-gal. can is 10 cts. for the first 5 miles, and 19 cts. for 40 miles. The rates for cream are a little more.

Minor Non-passenger Receipts.—The earnings from the carriage of dogs, large packages, musical instruments, etc., are too small to be considered as sources of traffic. In fact, such business is rather obnoxious than otherwise. A few rules are quoted merely to show how different railways handle this form of goods transportation.

Dogs.—The Detroit United Railway permits passengers with dogs attached to a chain or rope to ride on the rear platform or in the smoking compartment of interurban cars. Lapdogs, however, may be carried into the body of the car.

The Connecticut Company charges an extra fare for the transportation of dogs. The dog must go on the front platform with the motorman. In summer he is permitted to ride with the smokers on the five rear seats.

Large Packages.—Electric railways make no charge for valises, musical instruments, and equally bulky packages. However, the line must be drawn somewhere. The Denver Tramways balks at carrying vacuum cleaners for nothing. According to a bulletin issued in August, 1911, only the smaller cleaners weighing no more than 60 lb. may be carried, and for these a 5-ct. fare without transfer privilege must be paid. The cleaner must be carried in the rear of the car and out of the way.

Free Baggage.—An extremely liberal feature of American railways, both steam and electric, is the free carrying of baggage. On European roads on the contrary, the passenger pays for everything except hand luggage. In some states, railways are compelled to carry up to 150 lb. of baggage free. If the baggage privilege extended no further than actual carriage alone, the railway is still minus a pretty penny for this gratuitous service; but insult is piled on injury when it is also held responsible for losses or damages often placed at fictitiously high values.

In 1912 the traffic committee of the New York State Electric Railway Association recommended the following rules, based in part on steam railroad practice: Baggage liability for 150 lb. of baggage not exceeding \$100 in value to be checked without charge for each adult passenger, and 75 lb. not exceeding \$50 in value for each child on a half ticket. When baggage is checked on a commutation or family ticket, the limit should be \$50. No baggage should be permitted with low-rate excursion tickets.

Where the ordinary city or suburban car without baggage compart-

ments is concerned, it is easy to limit this evil as shown by the following rule of a line with such cars:

"No piece of baggage will be accepted for transportation which is too large to be put upon the front platform of car, or is too heavy to be handled by car crew. Large baby carriages and bicycles will not be accepted for transportation. No baggage in bad order, or too fragile to withstand ordinary handling, will be accepted for transportation, except at risk of owner. No baggage will be transported unless identified by the owner, and the Atlantic Shore Electric Railway does not guarantee to forward baggage on same car with the owner, but will do as the exigencies of each case may require."

The Cleveland, Southwestern & Columbus Railway in February, 1915, was carrying baggage on about 20 per cent. of its trains, for the most part, free. For an average month this road handled 2000 pieces of free baggage, the company carrying such free baggage only for passengers paying 25 cts. or more for fare. The fact that only 5 per cent. of the passengers were in the higher fare class indicated that even if half such passengers were driven away by a charge for baggage the company would be the gainer. This condition was typical of other lines in the Central States.

At this time, interurban operators are undecided as to the advisability of charging for baggage, preferring that their steam competitors do so first. But when an electric railway feels that it is its frequent service rather than its fares that gets the business, it ought to make a reasonable charge for this extra service. Free baggage benefits more particularly the traveling man who is already getting the cheapest form of transportation because he usually travels on a mileage book.

Package Freight Experiences of the Louisville & Southern Indiana Traction Company.—An interesting side-light on the package freight experiences of this company will be found in the following account from a paper prepared by J. F. Strattan and W. L. Foreman in 1915:

"The Louisville & Southern Indiana Traction Company operates a line between Louisville, Jeffersonville and New Albany, via the Louisville and Jeffersonville bridge. It operates a freight car between these three cities, maintaining freight stations at each point, and it operates a passenger service on a 30-min. headway throughout the day and on a 15-min. headway from Louisville to Jeffersonville during rush hours.

"When the line started the cars were equipped with package racks, and no restrictions were placed on the size of any package which a passenger wished to carry free of charge. The cars are equipped with spacious platforms, and passengers were allowed to deposit any kind of package which they could lift by themselves or with the help of another, onto the platforms. After a few months it developed that some means must be found to regulate this practice, which interfered materially with the operation of the line, increased the accident liability and in many other ways interfered with the transportation of passengers. It was finally decided to abolish the package racks and to make a charge of 10 cts. for all packages carried onto the car which could not be conveniently held, provided passengers would place them on the front platform and remove them on arrival at destination. At this time it was not

necessary for the package to be way-billed, the amount of the charge being collected by the conductor and turned in at the end of his run with the other remittances.

"After this rule had been in effect for some time it was found that there was a demand for a quick express service between the cities served, request having been made by quite a large number of people who did not wish to accompany packages on the car but wanted us to handle them. As there were many teaming companies which operate between Louisville and the other two cities and can cut whatever rates are made at will, it was finally decided that all we could expect to get for packages carried on passenger cars was 10 cts. Packages of this character, it was ruled, must be presented to the freight agent and way-billed in the usual manner. These packages were placed on the front platforms with the motorman, and the freight agents at the different stations met the cars and removed the packages to the freight office, where they were called for by the consignee. By way of further explanation, no passengers were allowed to ride on the front platforms of our cars. As these platforms are spacious, packages do not in any way interfere with the motorman.

"We found that this not only increased our revenue without increasing our costs but left more space in the freight car for heavier freight. At the same time it reduced the liability to damage of the lighter packages.

"For the convenience of shippers and to meet competition, a collection and delivery system was then inaugurated, and stamps in \$5 and \$10 books were sold at a discount of 10 per cent., provided that the purchaser would deliver the freight to our terminal for transportation. Advantage was taken of this service by a number of the larger stores in Louisville, which maintained a delivery service in New Albany or Jeffersonville, the traffic grew in volume, and we have always felt that it was very beneficial to us.

"The system of having the conductor collect for packages accompanied by a passenger was not altogether satisfactory, as we had no check on how many packages were being carried other than what our inspectors could report to us. It was desirable to change this system, but we disliked to do anything which would make it more difficult for a passenger to travel and transport packages over our line. About this time the war tax stamp act went into effect, and we were obliged to make it a rule that all packages should be presented to our freight stations, everything being way-billed so that we then had a complete check on all shipments offered for transportation.

"The operations of this company are more in the nature of a suburban road, although the towns which they connect are larger than those reached by most suburban companies, and it is therefore classed as an interurban road. This is not the case, however, with the Louisville & Northern Railway & Lighting Company, it being an interurban, operating a line from the city limits of Jeffersonville to Sellersburg, with a branch to Charlestown and also a line between New Albany and Louisville. No package freight is handled on this division.

"Tariffs are on file, naming rates on package freight carried on passenger cars between all points on the Louisville & Southern Indiana Traction Company, Louisville & Northern Railway & Lighting Company and the Indianapolis & Louisville Traction Railway Company; that is, between Louisville, New Albany and Seymour. These rates are approximately double the first-class freight rate, and there is a minimum charge of 20 cts. on the Louisville & Northern to points on its line and a like minimum of 25 cts. on the Indianapolis & Louisville for each package handled. No packages that cannot be conveniently held are allowed to be taken into the passenger cars, and all packages of a bulky nature are presented to the freight agent and way-billed in the usual manner. All this freight is handled on local passenger cars, most of which are equipped with baggage compartments, and when this is not the case, with spacious platforms. As 75 per cent. of the free baggage carried is handled on limited

cars, considerable unoccupied space is left on the local cars in which to handle package freight. These local cars leave Louisville for Charlestown and Seymour every 2 hr., so that the service rendered is even quicker than that of the old-line express companies operated on steam roads, while the rates are considerably less. It must be borne in mind, however, that we do not make house collection and delivery.

"Advantage is taken of this service not only by residents of the towns along the line but also by the farmers, who find it convenient to order what they wish from the city by telephone and have it in their possession within a very short space of time. Thousands of berry crates are also shipped to the larger cities each year by our lines, Indianapolis being the destination for the bulk of these shipments. The rate on berries is 50 cts. per 100 lb. Early in the season, before enough berries are offered for shipment to make it profitable to operate a through fast freight car, these berries are handled up to 100 crates on the local passenger cars. Formerly the old-line express companies received all of this business. This service places berries in Indianapolis in about 5 hr. after they leave the shipping point."

Package and Local Carload Freight on the Pacific Electric Railway.—

On this great system package freight is handled in one to three-car trains of express-freight units. They make two trips daily over most of the lines, one in the forenoon and one in the afternoon over the heavier traffic lines, and one in the early forenoon over the lighter traffic lines. Generally, these same cars return to Los Angeles loaded with milk, cream, and package shipments of berries, vegetables, etc., for the Los Angeles markets, the empty cans and crates being taken out and distributed on the outbound trips of such cars and trains. On some lines, however, the milk traffic is of such volume that some runs of such cars are classified as strictly milk trains and are in that service exclusively, returning the empty cans to their many points of loading on the outbound trips. Freight delivered in the forenoon is forwarded on the afternoon trip, and is generally in the consignee's hands the same afternoon or evening; that delivered during the afternoon and evening is forwarded on the next morning's trip of such distributing cars and is delivered to consignees before noon the day following its delivery for shipment to the freight station in Los Angeles. These express-freight distributing cars also carry what is commonly called less-than-carload perishable freight, such as the daily supply of fresh milk, ice cream, fresh meats, fresh fruits, vegetables, etc., from the larger markets in Los Angeles for the daily supply for the larger outlying cities, particularly the beach towns and cities, such as Long Beach, Venice, Santa Monica, and the various ocean and mountain resorts served by these lines. Heavy or imperishable shipments of less-than-carload merchandise received at the Los Angeles freight station during the day are, as far as possible, loaded into separate cars for the larger cities and towns, thus reducing to the minimum the handling and distribution of less-than-carload shipments by crews on the night freight trains. Where there is sufficient of such shipments to fill a car or cars for a town, the cars are sealed at Los Angeles, sent out

in the night freight trains and placed at destinations ready for unloading by the station force the first thing in the morning, so that consignees may secure the goods in time for that day's business.

This kind of service causes the local merchants and shippers, even at points strongly competitive with one or more steam roads, greatly to prefer the electric railroad's freight service over that of the steam roads.

Farm Instruction Service.—Following the example set by progressive steam railroads, like the Southern Pacific Company, a number of electric railways have inaugurated farm instruction service to show farmers along the line how they can obtain bigger and better crops or improved dairy or live-stock output. Preferably such work should be carried out as part of a local university's extension course. In such case, the railway furnishes the rolling stock and the college the lecturers and the demonstration material. This plan is successfully used by the Oregon Agricultural College and the Southern Pacific Company.

The farmers' instruction service so far as electric railways are concerned has sprung from humble beginnings. A pioneer was the manager of the Albany Southern Railroad of some ten years ago who used his knowledge of farming to prove to local farmers that they should go into the milk business because of the rich grasses for fodder. The results were gratifying to the farmers and the railway.

The work of the Providence & Danielson Railway, now a part of the Rhode Island Company, also is worthy of attention. This railway on opening up its virgin territory, found that few of the backwoods farmers were in the most profitable lines. The nearby large city of Providence wanted such things as milk and berries as fresh as possible, and it proved a ready buyer when the goods were produced. Incidentally, the local storekeepers through daily deliveries could keep smaller yet fresher stocks for their farmer customers.

The Otsego (N. Y.) & Herkimer Railroad made a study in 1908 of what products were most in demand, especially in the New York markets. The co-operation of the State Agricultural Department was obtained, advisory letters were sent to all farmers within 5 miles of the line and meetings of farmers were arranged. In 1908 no peas had been grown in this territory; in 1909, 40 acres were cultivated and in 1910, 60 acres. In like manner, the potato crop, represented in carloads, rose from 20 in 1908 to 80 or more in 1910.

An interesting example of electric freight service developed from small beginnings to a profitable volume of traffic is afforded by the Charleston line of the Bangor (Maine) Railway & Electric Company. The gross earnings on this road, which is 25 miles long and serves a purely agricultural district, rose from \$32,000 in 1908 to \$65,000 in 1914, due in large part to the reduction of the shipping rate on potatoes and to a model farm.

The model farm is 6 miles from Bangor and in 1914, 40 acres were under cultivation, 30 acres being devoted to potatoes. The company financed the enterprise, which is operated by an expert agriculturist who is on the staff of the University of Maine. The average yield of potatoes in Maine is 200 bu. per acre, and the model farm is being run with the expectation of obtaining 400 bu. per acre. During the summer the company holds farmers' meetings on the model farm, with lectures and inspection of exhibits. In this way the farmers in the neighborhood have an opportunity to study at first-hand the latest methods used in scientific farming. Aside from this farm the company has also organized an association for selling produce.

The Shore Line Electric Railway, Norwich, Conn., has a farm bureau which maintains lists of all farms and other real estate on the markets. The employees of the company have in a number of cases joined local



FIG. 111.—View on model farm of Bangor Railway & Electric Company.

granges to come closer to the farmers, and an active co-operative movement is under way along the lines found successful by the government. Instead of establishing and maintaining a model farm of its own, the company favors helping the local farmers to secure the best results on their own properties. Demonstrations are, therefore, made on the farms themselves, the work being done by the farmers under expert guidance. In this way the temptations to do too much on a grand scale common to corporate farms are avoided.

At Norwich, a warehouse has been built and a physical connection is in service between the Shore Line and the New York, New Haven & Hartford Railroad. Another warehouse is located at New London, Conn. In the former city, the farmers on the company's tributary lines maintain an agent at the terminal who is thoroughly experienced in grading, sorting, crediting, shipping, packing and selling agricultural products, and the results are most beneficial. Time is saved to the farmers by the shipment of their products into these terminals by electric express cars

and better prices are secured than where sales are handled by the farmer as an individual. Through this co-operative movement efforts are being made to establish a standard quality of products which would yield profits through their reputation.

On New England properties generally, the quicker and more frequent electric service has made the sale of non-refrigerated berries possible.

To develop the knowledge of the ranchmen and farmers along its interurban lines, the Portland (Ore.) Railway, Light & Power Company had for a short time an agricultural department with a practical farmer at its head.

The land owners, as a rule, have small tracts running from a town lot up to 160 acres or more. It was felt by the management that more freight could be obtained if the ranchers and farmers were instructed regarding market conditions and the best form of diversified farming. With this view in mind it secured the services of an expert who talked to the ranchmen at schoolhouses and other points. It was found that little tonnage was to be secured from garden products or from some of the lighter yields of these small ranches; that freight tonnage and its increase depended on interesting the farmer in raising hogs and fruit. A postal card containing the following questions was sent to each farmer and a compilation was made to classify each as to principal yield:

1. Name.....
2. Post-office address.....
3. How many acres under cultivation?.....
4. How many acres not cultivated?.....
5. What does your crop consist of and how many acres are planted in wheat, oats, rye, barley, vetch, hops, potatoes, vegetables, corn?.....
6. How many acres in small fruit?.....
7. How many head of live-stock have you—cattle, hogs, horses, sheep chickens?.....

Stereopticon lectures, reading matter and the co-operation of the agricultural department of the state as well as of the United States were also secured to assist in giving the farmer the proper literature. Not only did the company's expert hold meetings, but he visited the farmer in his home and he went out in the field to give the farmer the benefit of his experience. It may be noted here that the Illinois Traction Sys-

tem encourages corn-growing contests among boys by offering free excursions to the winners.

It is the policy of the Pittsburgh, Harmony, Butler & New Castle Railway to lend all encouragement possible to the development of agriculture and horticulture along its road. The liberal use of lime by the farmers has been recommended by the general freight agent, who is a member of the grange. He attends grange meetings and gives talks on the subject of lime as well as on that of direct marketing.

The plan of the Southern Pacific Company for both its steam and electric lines is to furnish a demonstration train in connection with the extension work of local colleges. The train is operated on a rigid schedule, notices of its coming being sent to all farmers and commercial bodies in the territory affected. The train is in charge of specialists from the university faculty who bring along a complete exhibit from different kinds of silos to varieties of hogs and cows.

Population distribution is also watched for the farmer's welfare. Thus when the "Loop" Southern Pacific lines at Portland were electrified, the increase in commuter population led to a noticeable increase in truck gardening as well as to a general stimulation of trade with the city.

An addition in 1915 to the ranks of the farmer educators was the dairy husbandry department of agricultural extension Purdue University, Lafayette, Ind., in co-operation with the Fort Wayne & Northern Indiana Traction Company. The railway furnishes a passenger car for the lecturers and a freight car for exhibits of feeds and articles necessary for the correct feeding of cattle. The train is operated not only over the lines of the railway named but over several connecting roads.

Farmer and railway have also been brought into closer relations through other means. At certain times of the year the farmer's crying need is for labor. Therefore, a railway might take the initiative as did the Texas Traction Company in 1915 when it ran a "labor special" and announced to the farmers that the unemployed of Dallas had been recruited and were at their service.

Again, the Louisville & Interurban Railway not only gets its share of the ripened product, but handles a good farm tool, seed and fertilizer business in the spring by convincing the farmer that his time is better spent on the farm than in teaming to town for such equipment.

Farm Freight by Trolley to City Markets.—While the interurban railway has sought to increase the output of the farmer, the city railway has begun to manifest an interest in helping him to market that output. The most direct way to do this is to cheapen the cost of transportation and distribution; in other words, ship from farm to city without rehandling and sell the produce in public markets.

The chief obstacle to this plan has been the fact that city railways are

not generally permitted to haul freight cars. Therefore, it is first necessary to prove to the local voters and legislative bodies that the trolley freight service will be a public benefit.

Thus during several years past the Bay State Street Railway has been securing franchises in many towns for the operation of an electric express service, and in the few towns where opposition was manifested the company appealed to the State Public Service Commission. Late in 1911 also the neighboring Boston Elevated Railway received the right from the Commission to act as a common carrier of baggage and freight in Boston. In the same year the Missouri & Kansas Interurban Railway received the right from the Kansas City Council to put tracks into the city's market house with the view of making direct delivery of fruit and vegetables. At Cleveland, where the subject of trolley markets had been agitated, the interurbans were permitted by popular vote Nov. 4, 1913, to haul freight through the streets at night.

On the whole, it is difficult to see the fairness of the criticism that trolley freight should be forbidden because of unsightliness and noise. If the freight was not taken through the streets by car it would have to be carted over the same streets in a larger number of much noisier trucks, and the cars make no use of the street pavement which the trucks wear out rapidly at the expense of the taxpayers. Finally, such a car service need not interfere with the busiest city schedule since produce cars going inward would naturally be operated only during the very early morning hours, while they could be returned during any of the slack hours of the day.

The granting of freight franchises as in the instances quoted indicates that this part of the problem is not insuperable.

In a preliminary report to the Chicago City Council, the Municipal Markets Commission, appointed by the Mayor in April, 1914, recommended the use of electric railways to bring farm products direct to the household or the retail markets. In this connection, the report said in part:

"In order to give the producer direct access to the markets of the city, and to furnish the Chicago consumer with a fresher and more varied allotment of farm products, electric railway freight service should be placed in operation over the existing street-railway lines, and the interurban railways should receive direct access to the city's market. Rapid and easy access to the new markets by street railways to and from the city will encourage production and result in a vast amount of undeveloped land near the city of Chicago being divided into small truck, poultry, dairy and fruit farms. Urban and interurban street railways should be operated to shorten the route between the producer of farm products and the consumer, but carrying of freight by street railway lines inside the city limits should not be permitted to interfere with the proper handling of the passenger traffic. Freight handled by the interurban railways could be carried over the local Chicago lines between 11 p.m. and 5 a.m. without inconvenience to the public."

The Chicago produce market is concentrated on South Water Street in the downtown district, a point not reached by the steam roads or any transportation system other than wagons. This market is considered inadequate, insanitary and wasteful. In its recommendation to the City Council, the commission stated that the city should proceed to formulate plans for a comprehensive system of wholesale terminal markets under the control of the city accessible to the city and interurban railways. It was estimated in the report that \$51,000,000 a year could easily be saved if the city would take advantage of all the transportation and other facilities now afforded to eliminate waste between the producer and consumer.



FIG. 112.—Typical freight motor car.

An investigation of the entire subject has shown that in almost every city farm products have to pay toll to four interests during their passage from the farm to the home of the citizen. The charges paid are those for transportation and the profits made by the jobber, the wholesaler and retailer. In most cases the transportation charge is by far the smallest of these four, and even this can be greatly reduced by means of an efficient electric freight service.

The fact is that the common way of retailing farm produce is an inheritance from the days when all of it had to be transported into cities in carload lots to a few freight stations in large steam-train units, with consequent delays in transit and delivery and with the overhead expenses unavoidable with shipments in large quantities. The trolley line with its short trains, its frequent service and its ability to deliver freight directly to the retailer or to the consumer through many small freight terminals

in different parts of the city makes the old system of jobber and wholesaler obsolete. Much attention has been directed to the success of public markets, as at Des Moines and Indianapolis, in shortening the route between the producer and the consumer.

Industrial Departments.—Still broader than the educational work for farmers is that of attracting new industries along the line. The electric railway has usually opened up new territory available for factory sites, and the superior flexibility of electric operation makes it more inclined than a steam railroad to install sidings for large shippers. Success in bringing the factory means perhaps only a small profit for short-line service but a large one for transporting the employees every day. There is not much nourishment for the railway in getting 10/2000 of the charge paid for freight shipped 2000 miles away. If the electric railway is giving a special service it should demand the right to charge a special rate just as steam belt lines do.

This work is usually in charge of a traffic manager who keeps a list of all manufacturing sites available for building or rental. In trying to bring sellers and buyers together he finds the local boards of trade natural allies. Since 1912, to name but one instance, the Louisville & Southern Indiana Traction Company and the Louisville & Northern Railway & Lighting Company have had a department to co-operate with the business men, commercial clubs and other organizations to develop territory in Indiana opposite Louisville. The service of this department is given free to those who want information in regard to homes, farms, truck gardens, fruit orchards, chicken farms or manufacturing sites within 20 miles of Louisville. The department also tries to induce people to settle in this territory and is ready to promote any meritorious project that will redound to the advantage of the territory.

CHAPTER XV

SELECTION AND TRAINING OF MEN

The type of men who apply for platform work on electric railways varies greatly according to the character of the property. The interurban and the small-town properties manage to get the best class of men for they can draw largely on the young men from nearby farms. The average farm lad has earned so little pay and has had such long hours that the better pay of platform service, and the shorter workday (no rising with the summer sun) are powerful attractions. The exchange of his nondescript dress for a neat uniform also raises his self-respect. It should also be remembered that the small-town platform man lives among his own people, and that even with \$50 to \$60 a month he can live as well as if he were making much more than that sum in a large city.

But a far different condition prevails on the electric lines in the cities. By far the largest portion of metropolitan car men are drawn from the ranks of unemployed clerks, carpenters, machinists, tailors and other trade workers. Statistics presented by the Bay State Street Railway on Mar. 29, 1915, before a board of arbitration showed that out of 3504 men, 13.4 per cent. were clerks, salesmen and agents; 12.3 per cent. teamsters and drivers; 11.4 per cent. shoe and leather workers; 8.1 per cent. textile workers; 8 per cent. from the building trades; 6.5 per cent. farm workers; 5.6 per cent. metal workers and foundry men; 2.4 per cent. servants and attendants; 2.6 per cent. tradesmen; 2.2 per cent. former conductors or motormen; 1.6 per cent. in steam railroad service; 1.2 per cent. fishermen and seamen; 1.6 per cent. from electrical trades; 1.2 per cent. government and municipal employees; 0.9 per cent. from printing trades; 10.4 per cent. laborers; 7.7 per cent. from miscellaneous indoor occupations; 0.6 per cent. from miscellaneous outdoor occupations, and 2.3 per cent. had unknown occupations.

Many of these men do not enter railroading as a profession but as a stop gap. They have been accustomed to regular hours, little discipline and still less responsibility. Hence, they leave as soon as an opening for a return to the old trade presents itself even at less pay and at a greater percentage of idle time. This fact shows how important it is to make the new man feel satisfied from the first day of his employment that he is going to get a square deal.

Steam railroad employees are sometimes compared with electric railway employees to the disparagement of the electric railway manager. This comparison is unjust. One big reason why steam railroading offers

far more attraction as a life work is that the chance for promotion is greater. Compare, for example, the number of electric railway conductors and motormen to one division superintendent with that of the steam conductors and brakemen to their division superintendent. Another reason is that the steam-railroad man's relations with the patron are usually of more pleasant character as most passengers on the steam train have purchased their tickets before they board the cars whereas the conductor on the electric car must be continually making change and watching to see that every passenger pays his fare.

Qualifications.—Most companies in engaging men for platform duty prefer those who have had no previous experience. This is contrary to practice in other fields, but is readily explained by the fact that an old hand is liable to have absorbed several important operating rules, which directly contradict the practices of the other company, and that having seen things done differently he is also likely to be less obedient than the green hand. An exception to this rule is required by an Indiana law which demands one year's previous experience in 'steam- or electric-railway operation of any applicant for interurban service.

In accepting the application for employment the company ordinarily demands three or four references from the applicant. Confidential letters are then sent to the persons referred to at an appreciable expense in stationary, labor and postage. It is doubtful whether this correspondence is worth its cost. It's a poor man, indeed, who cannot get some half dozen sympathetic individuals to vouch for his honesty, sobriety and general docility when they run no risk themselves; and the crook is the one likely to secure the most glowing praise of his character. A better plan, where the persons mentioned as references are accessible, is to have them interviewed personally by a representative from the office of the superintendent of employment. Vital facts can often be elicited in this way from an informant who would hesitate about putting the same statements in black and white. The employment agent should be, among his other qualifications, a good reader of character. What is aptly termed the "once-over" given by a man who can tell "the mind's construction in the face" is worth several reams of commendations from strangers. On one of the largest Central States interurbans every applicant is personally interviewed not only by the superintendent of employment but also by the division superintendent and the general manager himself. This policy should be followed wherever it is physically possible.

So far as applicants for a conductorship are concerned it is customary on some large systems to demand a bond for \$150. This is proper since so many of the applicants are absolute strangers. This bonding is also pretty good assurance that the bonding company itself will make a thorough investigation.

Attitude toward Applicants.—The attitude that a man takes toward the corporation that employs him is determined very largely by the reception he receives when he first applies for a job. If that reception indicates distrust in his integrity and involves a degradation of his rights as a man, the employer need feel no surprise later at sullen behavior and worse. Thus the first essential is that the man who guards the gates of employment should be kindly as well as keen. Yet for years one of our largest electric railways retained in its employment bureau an individual who addressed each applicant as follows: "Damn you, weren't you a conductor on the ——— Street line?" Of course, his object was to catch repeaters off their guard, but he offended ninety-nine innocent men to catch the hundredth wrongdoer. To make matters worse, most of the men had been forewarned of this method of attack, so that little good was accomplished any way. Eventually Mr. Brusque was dismissed. To-day a different practice is followed. After a group of recruits have passed the school tests they are introduced to an assembly of dispatchers and carhouse superintendents, who generally find no trouble in singling out the men who have been in their service before. The plan carried out involves no humiliation of innocent men and permits few guilty ones to escape.

Physical Standards.—The applicant accepted so far as references are concerned, the next step is the physical examination. The age which should be between, say, twenty-one and forty years has already been set forth in the general application. Such examinations should be severe for a number of reasons. (a) The platform man comes into actual physical contact with many passengers and should therefore be free from repulsive appearance; (b) if he is to be a motorman sturdiness is desirable—if a conductor, agility; (c) sound, general health as the cost of welfare plans made on an actuarial basis depends on average expectation of life; (d) positive freedom from deafness, color blindness and abnormal eyesight.

Motormen must usually weigh at least 150 lb. and be at least 5 ft. 6 in., tall; conductors need weigh only 140 lb. but be of same height as motormen. A modification due to adopting a pension system is indicated by the practice of the San Francisco-Oakland Terminal Railway in setting an age limit of thirty-five years for beginners and forty-five years for experienced men. Furthermore, the forty-five-year men waive all pension rights. On at least one interurban railway only married men who are at least twenty-three years old are accepted. The New York State Railways—Rochester Lines—while keeping the twenty-one-year minimum for conductors raised that for motormen, in 1914, to twenty-five years, thus getting a more staid class of men as the event proved.

The usual examination is thorough enough to discover any external or advanced internal diseases. Urine analysis, however, is not undertaken,

although it would be logical in view of the tendency toward bulk insurance. The most severe tests should be those relating to hearing, eyesight and color perception. In the case of city men color blindness may be excused as they have no colored signals to read other than an occasional red flag or lantern. Eyesight should not be tested with the standard optometrist's cards but with others unfamiliar to the applicant for it has been discovered that standard cards have been memorized in advance. Color blindness is best detected by making the applicant match skeins of colored yarns according to the Holmgren system. Eyesight tests should be repeated at regular intervals, say, yearly.

In view of the increasing use of power-operated devices on city cars, it would seem reasonable to modify the present general requirements for the physique of both motormen and conductors. When a car is operated almost continuously with air brakes and air-operated doors and steps, no Hercules is required; furthermore, the vestibules are now fully inclosed, well heated, often provided with a comfortable seat, and railed off to prevent jostling and crowding from passengers. The prepayment system has promoted many improvements for the conductor. The Public Service Railway was among the first to accept for conductors men shorter than 5 ft. 6 in. owing to more convenient fare-handling equipment introduced by prepayment devices.

Civil Service Platform Men.—A special standard in the selection of platform men has been set by the Municipal Railway of San Francisco where the men are selected according to civil-service conditions. Primarily the new way was adopted to avoid political favoritism, but the plan has merits which should commend themselves to private railway corporations. More than 3000 candidates applied, but owing to the high standard set in the physical examination only 711 men took the written examination for motormen and 798 that for conductors. Of these, 554 passed the motormen's and 633 the conductors' examination, all being above the passing mark of 70 per cent. The first ninety men in each list were appointed in time for the opening of the Panama-Pacific Exposition following twenty days of instruction by the Municipal Railway.

The general rules laid down by the Civil Service Commission follow:

Motormen.—Subjects and weights on a scale of 100: general knowledge of duties, 20; equipment and its care, 20; writing of report, 15; arithmetic, 5; athletic test, 35; experience, 5.

Conductors.—Subjects and weights on a scale of 100: general knowledge of duties, 30; writing of report, 15; arithmetic, 15; athletic test, 35; experience, 5.

For several weeks in advance of the quiz, candidates were furnished with "question and answer" circulars from which the examiners were to select questions for the examination papers on matters relating to "general knowledge of duties" (motorman or conductor) and "equipment and its care."

"Writing of report," in both examinations, was a test of the applicant's ability to write a correct report on subjects to be named by the commission and was rated on form and substance.

"Arithmetic" in both examinations consisted of primary examples covering common and decimal fractions.

The athletic test in both examinations consisted of the following exercises:

1. Ladder work.—Hand over hand on ladder, up and down five rungs. Mark, 10 credits.

2. Lifting 40-lb. dumbbell.—Five consecutive lifts with each hand. Lifts to be made from the lowest reach of arm to highest reach, without aid of jerk or swing, while standing erect with feet close together. Perfect mark, 10 credits.

3. High jump.—3 ft. 4 in., 10 credits; 3 ft., 5 credits. Use of springboard not permitted.

4. Vaulting the horse.—Perfect vault over horse 3 ft. 10 in. high, without touching it with any part of body excepting the hands, 10 credits; good vault, 7½ credits; fair vault, 5 credits.

5. Dipping on parallel bars.—Two dips, 5 credits each. Dips must be made with legs straight and without assistance of kick or swing.

6. Carrying 125-lb. sack of sand.—Sack must be lifted from floor, placed on shoulder and carried up and down six steps. Mark, 10 credits.

7. Running.—(Distance about 145 yd.):

Time, sec.	Credits	Time, sec.	Credits
21	40	25	30
22	38	26	26
23	36	27	22
24	34	28	15

(Fifty seconds rated proportionately)

Applicants taking the two examinations named in this circular had to appear but once for the athletic test, as they were rated in both examinations from the one athletic record. Candidates who failed to appear for the athletic test were barred from further examination.

The subject "experience" was rated as follows: Three years' experience in San Francisco as a motorman of railway cars, 100 credits; two years, 80; one year, 60. Experience as a motorman of railway cars outside of San Francisco, but within the State of California, was rated 10 per cent. less than experience in San Francisco, and such experience outside of California was rated 20 per cent. less than experience in San Francisco.

Experience as a conductor was rated in the same manner as provided above for rating experience of motormen.

Applicants had to be in sound bodily health and, before appointed, had to pass a medical examination before physicians of the commission. Candidates who secured places on the eligible lists and who failed to pass

such medical examination were to be removed from the eligible lists. Candidates who were unable to hear with each ear ordinary conversation at a distance of 20 ft., or who were unable to read, without glasses, with each eye, at a distance of 20 ft., letters on Snellen's eye chart marked "30" were to be rejected. Applicants taking examination both for motormen and conductors had to take but one medical examination.

Applicants had to be citizens of the United States, twenty-one years of age or more, and residents of San Francisco for at least one year preceding the date of the beginning of the examinations.

The athletic requirements presented look more like an examination for would-be professors of a turnverein than for the platform men of a modern car. Physical strength is desirable in a motorman for a certain amount of hand-braking is unavoidable. As discussed elsewhere, however, the development of prepayment makes it feasible to set much lower standards of physique for conductors. It is pleasant to note in any event that the examination is on the strictly logical basis of ability with no upper age limit. A middle-aged man who has taken good care of himself deserves the same chance as the younger fellows. An arbitrary age limit is unfair to the exceptional man.

A wise provision is that of assigning "equipment and its care" only to the motorman. The higher rating for motormen's "general knowledge of duties" is balanced by the higher rating for conductor's "arithmetic." This is logical inasmuch as it is the motorman's chief business to operate correctly and safely while the conductor's chief qualification is to present accurate accounting reports.

The low rating for "experience" is in line with the feeling of many operating men who believe that it is easier to break a raw recruit to their style of operation than to unteach and re-teach a man from some other system. We believe that with the wider adoption of standard operating rules it will be an advantage rather than a detriment to favor men who have made honorable records elsewhere. Slight differences in operating rules should be more than offset by the steadiness that can be acquired only through experience.

Professor Münsterberg's Test.—In his book "Psychology and Industrial Efficiency," published in 1913, Prof. Hugo Münsterberg describes a device which he invented for testing the natural ability of motormen to avoid collisions on the streets. The purpose of this test was to provide some scientific method of determining whether applicants for appointment as motormen would be safe on the streets and to permit a railway management to detect the unreliable men already on the operating force. Briefly the device consists of a series of twelve cards, $4\frac{1}{2}$ in. wide and 13 in. high. Lengthwise through the center of each card are two lines, $\frac{1}{2}$ in. apart, to represent a railway track. The face of

each card is further divided into $\frac{1}{2}$ -in. squares, and in each square is printed a "1," "2," or "3" in red or in black ink. No regular order was followed in the arrangement of these figures on the card. The "1" was supposed to represent a pedestrian who could move only one square, before the arrival of the car, the "2" a horse-drawn vehicle which would move two squares in the same time, and the "3" an automobile which would move three times as fast as the pedestrian, or three squares. The occupants of the street represented by the black numbers were supposed to be moving parallel to the track and so not be sources of danger, but the red ones were supposed to be moving at right angles toward the track and so were dangerous. These twelve cards were placed in a box provided with a moving shutter or window through which the entire width and $2\frac{1}{2}$ in. in height of the top-most card could be seen. As a crank was turned, the window traveled from one end to the other of the top-most card, which was then withdrawn, and the process was repeated with each of the other cards. As the different portions of each card became visible, the man under test was expected to call out the red figures which from their position and assumed rate of movement would tend to cross the track at the time that the car would reach the same point and thus cause a collision. The likelihood of such collision was determined by the position of these red numbers in relation to the track. Thus a pedestrian one square away, a horse-drawn vehicle two squares away or an automobile three squares away would be considered dangerous. But a pedestrian two or more squares away, or a horse-drawn vehicle one or three squares away or an automobile one, two or four squares away would be considered safe. A system of rating was adopted, depending upon the number of errors made by the observer and the speed at which the test was conducted. Professor Münsterberg conducted a number of experiments with this device on motormen in Cambridge, and while he says in his book that at the time of writing the investigation was still in its first stage, the results up to that time obtained by him showed a far-reaching correspondence between efficiency in the experiment and efficiency in the actual service.

Professor Münsterberg's method has been tried on at least one road, the Dallas Consolidated Electric Street Railway, with successful results. The apparatus used by that road is slightly modified from the original design as described by Professor Münsterberg, but in principle it is essentially the same. The Dallas road also applies the Münsterberg test for rapid and correct decision in emergencies in the selection of its motormen. This test is conducted with cards on which are printed different combinations of letters. It was originally devised for ship captains but has been found by the Dallas management to be useful also for applicants for the position of motormen. The same company also uses in its employment

department a psychological test for attention by printing on its examination sheet certain catch questions which are simple to answer if the applicant only follows the printed instructions which accompany the questions. The company reports an improved personnel as the result of the application of these tests.

Temporary Platform Men.—On some railways the wide difference between the summer and winter timetables or the regular and rush-hour schedules makes it necessary to hire extra men for short periods only. The Denver Tramways has solved the rush-hour question in a very satisfactory way by employing local high-school boys for $4\frac{1}{2}$ hr. a day. These lads are obtained with the co-operation of the school authorities who know what boys are anxious to earn some money to continue schooling or to help their families. They are paid 24 cts. an hour during the first year and 27 cts. an hour during the second year. In this way the extra list of the company has been greatly reduced. The boys are used only as conductors, but as the Denver Tramways Company uses trailers in the rush hours in two-, three- and even four-car trains, an extra supply of conductors is more necessary than motormen. The Denver plan, of course, is practicable only where the age limit for railway workers is not fixed by law at twenty-one years.

The summer question is one that can be solved along similar lines if the right kind of boys can be found. Railway companies have found that college men during vacation are not always satisfactory for this service because they do not take their duties seriously.

The Education of Trainmen.—The education of the platform man varies widely according to the size and progressiveness of the railway company, but during the past five years great advances have been made. These advances, in no small measure, have been due to the publication of statistics which showed that too many new men went on the cars ignorant of the proper operating methods and regulations. In the earlier days a week's tuition under a platform man only was held to be enough; to-day even the smaller systems have placed the instruction in the hands of one or more specialists and provided special teaching apparatus. The week has been superseded by two-week to four-week courses plus a probationary or follow-up period of two to six months during which the recruit may be kept in a class apart. The new system means a large expense for training, as much as \$60 per individual aside from wages during the breaking-in period, but the money is well spent since better and more correct training leads to fewer accidents and less dismissals from service.

Motormen-conductors.—On some of the smaller systems men are educated to work alternately on the front and the rear platform. One reason for doing this is to secure greater flexibility in operation as when

trailers are run, a second reason is that it varies the monotony of the work and a third that some one should be available to take the place of motormen (on small properties). At Sheboygan, Wis., all men are numbered consecutively and are known only as "trainmen." This would not be a good plan on systems where strenuous conditions call for much specialized knowledge at either end of the car. Thus main strength and a coolness approaching stolidity are the chief assets of the motorman, but these qualities are rarely combined with the spryness, quick wit and ability to figure that characterize the good conductor. The Denver Tramways Company is one of the few large systems which trains men for both ends of the platform.

All-road Teaching.—The most primitive instruction system is that where any regular active car is used and the teacher is one of the older platform men. This sort of thing is satisfactory only on the very smallest city systems, and even there improvement would be effected by securing an outside specialist to give the men an occasional talk on the proper use of equipment. The older men are usually better operators in the sense of coolness and general ease, but at the same time they may have some very bad habits such as handling the controller wrongly and running with dragging brakeshoes. The use of checking instruments on cars will do much to prevent the growth of such habits.

Schoolroom Teaching.—However, few companies are so small that they cannot dismantle some old car (with the trucks and motors alongside the body) to show the operation of the apparatus as the motorman on the car operates the switches and controllers. At a little more expense one can make a skeleton car with all the apparatus exposed for inspection and explanation, together with individual controllers, brakes, switches, bell ropes, etc., for class drills. To lend dramatic interest to the teachings about flow of current from the line through the various switches to the motors, a larger company can afford to get up a board on which painted or illuminated lines with tiny lamps show what motor combinations are made at each step of the controller; or a board with miniature practicable car devices from trolley pole to ground may be employed. Still greater interest may be awakened by using moving pictures not only to show again and again how the apparatus should be handled but also how careless men get into accidents and how careful men avoid them. Some companies show the men burnt-out armatures and other equipment damaged because of reckless running. It may be added here that the instruction room should be the best-lighted and best-ventilated place obtainable. One company has supplied its room with electric fans and spring water—two little courtesies that are pretty good evidence to the new man of the spirit of his future employer. It is hardly necessary to add that good light and air also help the men to learn faster.

In connection with moving pictures it has been suggested that a man's coolness could be tested in the schoolroom by timing his response in controller and brake manipulation to a street condition shown on the film—such as a child crossing the street. This test would be of some but not conclusive value because the student would expect or would be told by the other candidates to expect something of the kind. However, the repetition by the moving picture of the proper way to pull down a pole, to reset a switch, etc., will save the instructor a lot of hard work and harder profanity. Moving pictures are used now by the Pacific Electric Railway, the Public Service Railway and others.



FIG. 113.—Schoolroom for instructing trainmen.

Accident-courtesy Talks.—In the modern instruction more and more stress is being placed on safety, courtesy, loyalty and honesty. It should be pointed out in treating of courtesy that the platform man is not expected to argue with the passenger, but to emphasize the fact that he has no option but to obey the company's rules.

As to safety, some claim agents have done excellent work in their talks to the men both how to avoid and properly report accidents. They can also tell the men something about the tricks of lawyers in accident suits. We would not go so far, however, as one claim agent who suggested that a man who could not stick to one story on the witness stand should be dismissed as stupid. Those who have seen men of much

higher standing than a platform man browbeaten in court must agree that this is too harsh and impracticable a demand, but it is not impracticable to assume that accidents must occur some time and to coach the men accordingly.

Outside Instruction Tracks.—The information given in one or two days of schoolroom drill does not attain the stage of digestion until the student is placed in charge of a moving car, although much of it can be fixed in the memory by using booklets which present the schoolroom instructions in the simplest possible language. In Berlin, where the course ranges from fourteen to twenty-one days, only one-third of the time is spent in the classroom. After an examination by the car engineer and traffic superintendent of the district where the student is to go, he is placed in charge of a car for two weeks subject to the oversight of the roadmaster.

On most American properties the change is direct from the schoolroom to the passenger-carrying car under the tutelage of the senior platform men. In late years, however, several companies have selected some little-used piece of track as a test line on which the new men can work under the schoolroom instructor. Such test tracks are extremely valuable in giving the new men the feeling of operating a real car over real track, in becoming accustomed to observe and obey such traffic signs as "Curve," "Breaker," "Switch," "Stop," etc. At the same time the instructor can make more surprise tests with bell signals, passenger buzzer signals, deliberate removal of the pole, or other simulation of conditions that will gage the student's common sense. On the Rochester Railway's 2000-ft. track a number of movable dummies are used to simulate crossing people or vehicles. This company finds that the run track greatly cuts down the time spent with platform teachers. Five hours to three days is the range on the track. The total student time is seven days for conductors and nine to ten days for motormen. Six blanks used by the Brooklyn Rapid Transit Company in the training of motormen and conductors are shown in Fig. 114. Two blanks used by the New York State Railways are shown in Fig. 115.

Instruction on High-speed Lines.—On high-speed lines the course is necessarily more severe, and should include a study of the signal and dispatching systems for both ends of the platform. The motormen, furthermore, should have a week or more in the shops.

An interurban trainman who is liable to be stuck 10 miles from Nowhere must know how to bring that car home if it is humanly possible. On the other hand, a shop course for city men is not worth the trouble. It may even prove hurtful to have the men attempt a repair themselves.

The Chicago Lake Shore & South Bend Railway gives a four weeks' shop course, paying the men 17.5 cts. an hour. On the Indiana Union Traction interurbans, where the motorman recruit spends fifteen days

in training he is paid for the shop time at 15 cts. an hour. The Pacific Electric Railway gives a preliminary examination after three weeks in the school and on the road, and a final examination after sixty days.

The Conductor.—The foregoing remarks have referred mainly to the teaching of motormen. The future conductors, of course, are taught turning of poles, handling of signal and register cords, making out day cards; punching, distributing, registering and turning in transfers; classes

<p>(1) ASSIGNMENT FOR INSTRUCTION</p> <p>of Student Motorman _____ Badge _____ to _____</p> <p>Instructing Motorman _____ Badge _____ Run No. _____</p> <p>Line, pulling out at _____ A.M. _____ 191____</p> <p>I certify that the above named student has been under my instruction for the time shown below. His progress is shown by cross mark in square No. _____</p> <p>Remarks _____</p> <p>Signed _____ Instructing Motorman</p> <table border="1"> <tr> <th>Time</th> <th>Very</th> <th>Good</th> <th>Fair</th> <th>Poor</th> <th>Time</th> </tr> <tr> <td>Min.</td> <td>5</td> <td>4</td> <td>3</td> <td>2</td> <td>Min.</td> </tr> </table>	Time	Very	Good	Fair	Poor	Time	Min.	5	4	3	2	Min.	<p>(4)</p> <p>Depot, _____ 191____</p> <p>I certify that I have this day conducted the final examination of Student Motorman _____ Badge _____ and find that he is (not) qualified for the duties of his position.</p> <p>The character of his work is indicated by cross in square No. _____</p> <p>(Signed) _____</p> <table border="1"> <tr> <th>Very</th> <th>Good</th> <th>Fair</th> <th>Poor</th> <th>Time</th> </tr> <tr> <td>5</td> <td>4</td> <td>3</td> <td>2</td> <td>Min.</td> </tr> </table>	Very	Good	Fair	Poor	Time	5	4	3	2	Min.		
Time	Very	Good	Fair	Poor	Time																				
Min.	5	4	3	2	Min.																				
Very	Good	Fair	Poor	Time																					
5	4	3	2	Min.																					
<p>(2)</p> <p>_____ 191____</p> <p>I certify that I have this day ridden _____</p> <p>Student Motorman _____ Badge _____</p> <p>from _____ Street, to _____ Street</p> <p>Instructing Motorman _____ Badge _____, was _____</p> <p>Student's work indicated by cross (Signed) _____</p> <table border="1"> <tr> <th>Time</th> <th>Very</th> <th>Good</th> <th>Fair</th> <th>Poor</th> <th>Time</th> </tr> <tr> <td>Min.</td> <td>5</td> <td>4</td> <td>3</td> <td>2</td> <td>Min.</td> </tr> </table>	Time	Very	Good	Fair	Poor	Time	Min.	5	4	3	2	Min.	<p>(5)</p> <p>Instructor No. _____ has spoken to Motorman _____</p> <p>Badge _____ concerning the following violations, which appear as charges on his Personnel Record.</p> <table border="1"> <tr> <th>Class</th> <th>Item</th> <th>Violation</th> <th>To be filled in by employee spoken to.</th> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table> <p>I have been spoken to concerning the above violations, and understand that I must be more careful in the future.</p> <p>(Signed) _____</p>	Class	Item	Violation	To be filled in by employee spoken to.								
Time	Very	Good	Fair	Poor	Time																				
Min.	5	4	3	2	Min.																				
Class	Item	Violation	To be filled in by employee spoken to.																						
<p>(3)</p> <p>_____ 191____</p> <p>REPORT ON WORK AND PROGRESS OF</p> <p>Student Motorman _____ Badge _____</p> <p>_____ day.</p> <p>Instructing Motorman _____ Badge _____ found _____</p> <p>Student's work indicated by cross (Signed) _____</p> <table border="1"> <tr> <th>Very</th> <th>Good</th> <th>Fair</th> <th>Poor</th> <th>Time</th> </tr> <tr> <td>5</td> <td>4</td> <td>3</td> <td>2</td> <td>Min.</td> </tr> </table> <p>Chief Inspector _____ Motorman _____</p>	Very	Good	Fair	Poor	Time	5	4	3	2	Min.	<p>(6) QUALIFIED EMPLOYEE</p> <p>Inspection of Work of</p> <p>Motorman _____ 191____</p> <p>Conductor _____</p> <p>Line _____ Time on _____ Time off _____</p> <p>From _____ To _____</p> <p>Remarks: _____</p> <p>(Signed) _____</p>														
Very	Good	Fair	Poor	Time																					
5	4	3	2	Min.																					

FIG. 114.—Set of six forms used to record the progress of a student trainman, Brooklyn.

of fare, free tickets; how to make out accident reports and get the names of witnesses; operation of doors; operation of fare boxes and registers; location of light and heater switches; handling ventilators; flagging at crossings; delay slips, etc. Much help is given by the use of enlarged transfer tickets, fare receipts, etc. The latter instruction is often presented by the regular teacher, but ought to come from a member of the auditing department who can lay due stress on the financial responsibility

of the conductor. Only a few companies have tried to add instructions in enunciation, but with little success. Conductors who can call out streets and stations clearly would save the nervous stranger many an anxious moment, but what is to be expected of an humble platform man if actors and public speakers are so often at fault?

In view of the value of the telephone in reporting traffic troubles and accidents the men should be taught to use it as a matter of course. This applies especially to our larger cities where men of the platform class

NEW YORK STATE RAILWAYS INSTRUCTOR'S REPORT									
NAME _____ BADGE _____									
Station To		CAR _____ LINE _____		Station To		Station To		Station To	
Not Station To		DATE _____ TIME _____		Not Station To		Not Station To		Not Station To	
		Spine handle	1			1 Fan air			
		Four graduated release	2			2 Emergency on, standing			
		Not fully released	3			3 Four graduated release			
		Head off running	4			4 Run in lap			
		Head off standing	5			5 Run in clear release			
		Correct				6 Standby car with air			
		Headway running	1			7 Air on at Tunnies			
		Placing in train	2			8 Hand brake set with air on			
		Placing standing car	3			9 Talk to use hand brake			
		Talking unnecessarily	4			Correct			
		Fast over special work	5						
		Looking back in car	6			1 Fast feeding			
		Fast past blind street	7			2 Off to train			
		Scrambling gang	8			3 Steps but not catches			
		Spine wheels	9			4 Run on resistance			
		Slide wheels	10			5 Steps in transition			
		Starts on one ball	11			6 Off too slowly			
		Planes up passengers	12			7 Power before release			
		Safety steps	13			8 Circuit Breaker			
		R. R. crossings and bridges	14			9 Off platform without handle			
		Ventilator doors	15			10 Returns to stop			
		Seat	16			11 Electric track switch			
		Correct				12 Motor cut out switches			
						Correct			

NEW YORK STATE RAILWAYS SYRACUSE LINES INSTRUCTOR'S REPORT									
NAME _____ BADGE _____									
Station To		CAR _____ TRAIN _____		Station To		Station To		Station To	
Not Station To		DATE _____ TIME _____		Not Station To		Not Station To		Not Station To	
		One Ball to start	1			1 Error in trip sheet			
		Balls at end of line	2			2 Calling streets			
		Before passengers are safely on or off	3			3 Calling transfer points and destinations			
		Two Balls before car stops	4			4 Calling front way out			
		Ring car bell	5			5 Operation of Page down			
		Holding bell cord	6			6 Position on car			
		Correct				7 Backing car from inside			
		Failure to register fare	1			8 Dirty steps and platform			
		Register fare in benches	2			9 Ventilators			
		Calling fare please	3			10 Signs			
		Register dial reading wrong	4			11 Stoves			
		Failure to turn register	5			12 Failure to get windows			
		Misplaced transfers	6			13 Railroad crossings			
		Tunnels at wrong points	7			14 Personal appearance			
		Correct				Correct			

FIG. 115.—Inspector's reports on student motormen and conductors, New York State Railways—Syracuse Lines.

rarely use a telephone. The Brooklyn Rapid Transit System has devised a scheme of having recruits telephone imaginary reports from a booth in the schoolroom to a clerk in an outer office.

Running on the road after the schoolroom and test-car course of, say, ten days, to two weeks, the student is ready for platform duty under the guidance of a regular motorman or conductor instructor. It is highly desirable that their duties should be confined to teaching the student the special conditions of the road and of imbuing him with confidence in going

it alone. It is customary to place a new man with several platform teachers in turn for the twofold purpose of acquainting him with all the lines of a division or system as the case may be and of getting a better line on the ability of the new man. For the latter purpose, the instructors are furnished with a breaking-in card on which they report the student's work at intervals during or at the end of the tutelage period. During this time the student has been poring over the rules, and if he succeeds in passing the examination in car operation as given at the schoolroom, he is examined as to his knowledge of the rules by the division superintendent, superintendent of employment or other executive officer according to the character of organization in vogue. Further, when the new city man reports at the carhouse to which he has been assigned, the local supervisory officer examines him as to his knowledge of the streets. If this quiz is satisfactory the supervisor signs the breaking-in card, sends it to the employment department and the man is thus formally accepted.

Approving the Recruit.—In view of the caliber of the average man taken for city services, it is customary to make the examinations for beginners largely oral and not to give written tests on the rules until after the men have had time to learn their application on the road. This does not apply, of course, to examinations in making out accident and delay reports, trip sheets, etc. Men hired for interurban service should receive a more strict examination such as their graver responsibility demands. The Aurora, Elgin & Chicago Railway demands a minimum rating of 95 per cent. in the rule-book examination before accepting the recruit.

Owing to the responsible character of the work employees of high-speed lines are usually re-examined every year. It is better that the re-examinations in rules should be given in writing instead of orally. The men will be better pleased (as they so expressed themselves on the Cleveland, Painesville & Eastern Railroad in 1911 when that company changed from oral examinations) because they are less likely to be flustered. The company will also find the written examination of advantage in proving on the witness stand that its employees do know the operating rules.

Probationary Periods.—Formerly when a new man began active service he was treated exactly like the other men with regard to operation and discipline. Operators are now beginning to realize that this is a mistake. In the first place the habits that a man forms during his first months of service are those that stick; in the second place it is unfair and discouraging to new men to discipline them as severely as men who have been in the service long enough to know better. The old policy meant losing 20 to 50 per cent. of the new men during their first six months.

In line with this thought several companies among others the Boston Elevated Railway and the New York State Railways have inaugurated

probationary periods of two months, and six months respectively, during which the chief instructor keeps in touch with the fledglings. The procedure at Rochester on the New York State Railways, as described in the following paragraph, shows how this scheme works out.



FIG. 116.—Model for showing operation of electrical equipment, Brooklyn Instruction Room.

After the final examination, trainmen are put to work on the extra list in accordance with the general practice. But instead of being left alone they are followed up by the traveling instructors, who ride with them four or five times a day during the first week and less frequently as they improve in their work. Reports are sent in daily to the super-

visor of instruction, who thereby keeps in touch with the performance of the men and can call them in for additional instruction if necessary. He also investigates accidents of men under six months in service, taking them back on the road for additional practice or giving such other supplementary instruction as may seem advisable. The men are given to understand that the instructors are not directly concerned with the administration of discipline and that no demerits are given on account of any report made by them. While it is a part of the instructors' duties to admonish the men at fault, their chief endeavors are directed toward helping and encouraging them and toward making their work as easy and interesting as possible. Of course, such major offence as stealing, gross negligence, drunkenness and insubordination do not and cannot come within this plan. A report made to compare July 1, 1913, with Sept. 1, 1914, the period of the plan, showed that the proportion of motormen in the service less than six months had decreased from 18.01 to 7.11 per cent.; the decrease in the case of conductors was from 19.95 to 12.46. Economic and other causes aided these results but the follow-up plan deserves the most credit. Accidents due to new men were also cut from 35.16 per cent. in October, 1913, to 19.3 per cent. in August, 1914.

A similar plan was inaugurated Feb. 1, 1914, on the Syracuse Lines of the New York State Railways. The first year's operation showed a reduction of 20 per cent. in the number of new men. At \$40 breaking-in cost per man (exclusive of accidents) the saving was about \$4000.

The Public Service Railway, Newark, N. J., follows up from the instruction department the work that a recruit does during his first three weeks of platform duty as an extra. During this period he is accompanied once or twice a day by the chief motorman who devotes himself to curing any special weaknesses. This extra polish has done much to reduce the accidents of the first-year men. The company also has special instructors who show the men how to run safest and with maximum coasting.

A good example of a follow-up policy on an interurban railway is offered by the Utica (N. Y.) & Mohawk Valley Railway, where a motorman instructor and conductor instructor follow the men for 100 days after the fifteen-day breaking-in period.

It may be noted here that the platform instructors themselves should be followed up by the chief instructor. On the Houston (Tex.) Electric Company the chief instructors' lectures have been written out in book form and the platform instructors, using these as a basis, meet once a month to refresh their knowledge and exchange experiences.

Payment for Breaking-in Time.—Many of the men who enter the service are short of ready money, and a liberal policy is desirable as to

giving them their equipment on credit. It is harder to answer the question whether the men should be paid for their breaking-in time, extending as this does over ten days to two weeks. It has been pointed out that it costs the railway itself an appreciable sum to train the man, whereas in other lines of work men are but too glad to pay for their training. To pay men for their breaking-in time is really a matter of expediency or generosity, rather than justice. If this policy is adopted the payment should be made simply in the form of a bonus for having remained in the service beyond the critical period. Thus the Public Service Railway of New Jersey gives a man \$10 after he has completed his first year. The International Railway of Buffalo, N. Y., and the Boston Elevated Railway pay \$1 a day during the breaking-in period. The former company, however, deducts payments of this kind from wages due to men who leave within six months.

The Education of Supervisory Officers.—We have seen from the earlier paragraphs that the training of platform men has been worked out in much detail. Unhappily this is not yet true for such supervisory or petty officers as the platform instructor, the supervisor, the inspector, the dispatcher and the station or depot master. The situation, in fact, is like that of an army wherein only the privates receive a detail training. It is still the most general practice for the superintendent to promote men from the ranks on a purely personal estimate of their ability to direct others, following possibly their application for such work. Many companies do not pay inspectors and starters more than senior trainmen. We believe, however, that greater responsibility calls for greater pay even if the work is more agreeable and includes vacation with pay.

Of course, it would be absurd to make promotions on a strict seniority basis or even on a merit system alone, since a first-class platform man, and particularly the steadiest kind of motormen, might be a failure where executive ability and clerical exactness in reports are the most needful qualities. Even platform instruction should not be delegated to a man because of his seniority, unless his chief task is to instil the younger man with self-confidence rather than to give him lessons that should come from a professional teacher.

Qualifications of a Supervisory Officer.—The supervisors and inspectors must be still higher grades of men for they are entrusted with the direct oversight of the platform men and the handling of traffic under very arduous conditions. Again, in the starter and depot masters, too, the ability to handle men must be joined with the intelligence to read if not construct and adapt the schedules. In general, the petty transportation officer, while drawn from the ranks, should be selected on a basis where seniority will swing the balance in his favor only when the other conditions are equal.

It will properly be asked what other definite conditions can be urged besides seniority, agreeable appearance (in the case of inspectors before the public) and executive ability. This question, so far as the inspector is concerned, seems to be answered in part by the form of examination given Oct. 31, 1914, by the San Francisco Municipal Railways. Of course, no examination can disclose a man's executive ability, but this one was of a nature which at least proved his intelligence and specialized knowledge. Out of 100 possible points it is significant that the examiners gave only 5 points for "Experience," the equivalent expression for "Seniority." These 5 points in turn were subdivided into 100 credits, a minimum of 50 being granted to three-year men, of 75 to four-year men and of 100 to five-year men. Fifty points were possible for "General Knowledge of Duties" and 25 for "Writing of Reports." This left 10 points each for "Arithmetic" and "Ascertained Merit." The last item was based on the applicant's record for freedom from demerits, being just a good behavior record but susceptible of a broader interpretation that would make some allowance for personality.

The following questions asked under "General Knowledge of Duties," "Writing of Reports" and "Arithmetic" indicate that those who succeeded were at least well qualified mentally for the job.

GENERAL KNOWLEDGE OF DUTIES

Name four important duties of an inspector. 8 credits.

Name four important duties of a car dispatcher. 4 credits.

What are the rules regarding the issuance of transfers on the Geary Street line? 5 credits.

What are the rules regarding rights-of-way at the various crossings on the municipal lines on Van Ness Avenue and Potrero Avenue? 5 credits.

Name the streets in order as follows: (a) On the Geary Street line from Fillmore Street to Arguello Boulevard; (b) Presidio and Ferries line from Van Ness Avenue to the Presidio. 20 credits.

You are an inspector at Van Ness Avenue and a motorman of a car complains that his car acts badly and he does not know what is the matter. Name three points where you should first look for trouble. 6 credits.

While you are acting as an inspector at Fillmore and Geary Streets, a trolley wire breaks at Geary and Steiner Streets. State what you did. 5 credits.

You are an inspector of the municipal railways detailed at the ferry. Travelers ask you for directions for reaching the places named below. Give best directions for reaching them by the street cars, preferring the municipal lines when they do not require the traveler to walk more than two blocks: Scottish Rite Auditorium; main entrance to exposition; Hamilton Square; temporary city hall; hall of justice; United States mint; United States custom house; Lane Hospital; Southern Pacific Railway station; new city auditorium. State place at which you directed traveler to leave the car. 20 credits.

An inspector is required to turn in a daily report. Name seven subject titles under which the rules of the municipal railway require the matters covered by such reports to be classified. 7 credits.

Assume that the running time, with lay-overs, for round trip from the beach to the ferry is 99 min., equal time each way, and there are twenty-two cars to be operated on an even headway, the cars to be started at the beach, the first car leaving at 5.35 a.m. Make a schedule showing leaving time at beach and at ferry for first five runs up to about 10.50 a.m. 20 credits.

WRITING OF REPORT

You were detailed as an inspector on the Geary Street line at Van Ness Avenue. A fire occurs at Van Ness Avenue and Geary Street and several lines of hose are run across the tracks. In your judgment the blockade will last more than 1 hr. Cars are operating on a 3-min. headway on Geary Street and on a 6-min. headway on Van Ness Avenue. Fifteen minutes after this fire occurs you are notified that a car has been derailed in the crossover at Van Ness Avenue and Bay Street.

Write a report in not less than 100 words, addressed to the superintendent of the municipal railways, explaining the circumstances and telling what you did as an inspector. 100 credits.

You are an inspector detailed for 1 hr. at the receiving desk at the carhouse. Five cars turn in their cash with record of full fares received, as follows: Car No. 1, 625 fares; car No. 2, 783 fares; car No. 3, 596 fares; car No. 4, 759 fares; car No. 5, 847 fares. On counting the cash you find car No. 3, 15 cts. short. How much cash was received? 15 credits.

The cash receipts of one day's operation of the Geary Street line are \$868.45. In addition, transfers are received to the number of 6835. What is the total number of passengers of both classes during the day? 15 credits.

The municipal railway carried the following passengers in its first year:

Full-fare passengers.....	8,882,996
Half-fare passengers.....	49,035
Revenue transfer passengers.....	49,543
Non-revenue transfer passengers.....	631,363
Non-revenue passengers.....	110,240

What was the total number of passengers carried? 10 credits.

The total passenger car mileage for the first year of operation of the municipal road was 1,300,868.65 miles. What was the average number of miles traveled daily? 20 credits.

The city lines received transfer and cash fares as follows: 5280 transfers from the Kearny Street line; 3890 transfers from the Larkin Street line; 8520 transfers from the Divisadero Street line; 10,850 cash fares. The city received from the United Railroads 2 cts. for each Kearny or Larkin Street transfer and 2½ cts. for each Divisadero Street transfer. What was the total amount in cash received by the city for the cash fares and said transfer? 20 credits.

What is the total amount of a payroll consisting of the following items: 178 motormen, each 212 hr. at 37½ cts. an hour; 172 conductors, each 219 hr. at 37½ cts. an hour; 23 car repairers, each 244 hr. at 42½ cts. an hour; 11 trackmen, each 198 hr. at 37½ cts. an hour; 5 machinists, each 242 hr. at 52 cts. an hour? 20 credits.

An examination like that quoted should certainly bring forward the most literate of the men already employed and encourage the entrance of better educated men to electric railway service. The method would be

greatly strengthened, however, if a set allowance is made for personality, not by one superior officer but as the averaged ratings of a committee.

Usual Mode of Training Supervisory Officers.—In contrast to the foregoing we may quote the less definite practice of several large railways in choosing supervisors and inspectors. After a man has been selected by his superintendent as suitable for the position he goes to the school-room for instruction in the duties of a conductor, if he has been a motorman, or in the duties of a motorman if he has been a conductor. Thus he becomes practically acquainted with both ends of the car and is further grounded by the superintendent in a fresh study of the operating rules. The San Francisco test is more in accord with modern conditions than that just described, for an inspector's ability to handle figures and make accurate reports has become a valuable quality in these days of traffic studies and scientific schedule making.

It should be clear that the combination of talents described is not to be obtained by paying an inspector no more than the highest platform wages, even if his longer though easier hours add say half a dollar a day to his pay. If on an hour basis, the rate should be several cents an hour more or else an equivalent monthly rate should be in force. There is every reason to believe that with set examinations and good increases in pay for the petty officerships more high-grade men will enter the service and a more ambitious spirit will be fostered all along the line from the car platform to headquarters.

The education of the petty officers should not end with the examination that promotes them. They should have meetings at stated intervals, say once a month at the schoolroom or elsewhere, to become acquainted with new equipment and regulations and to exchange experiences with their fellow-officers and superiors. The management should further arrange to follow up the work of the newly appointed men just as is now done in the case of platform recruits. Finally, the percentage of men which a higher petty officer, like a station master, loses in the course of a year is a fair criterion of his work if he is not handicapped by hard schedule conditions. If he is charged with the accidents caused by his own men he will be most effectually prevented from discriminating against the older men to show a lower platform cost.

Deposits, Uniforms and Supplies.—Unlike the German and other Continental lines, American electric railways do not universally require a deposit from new employees (about \$18 in Germany) as an earnest of good behavior, but conductors are often bonded in \$150 to \$300 either at their expense or that of the company. In a report of the committee on the training of transportation employees, made in 1912 to the American Electric Railway Transportation & Traffic Association, eight out of 104 companies replying furnished uniforms free to all of their men. All

of these were city lines. This number, we believe, has not increased appreciably.

In some instances, new men are obliged to buy only a cap and after they have been in service a few weeks the company advances credit for a full uniform. The German practice is to furnish and maintain all such equipment without charge, but of course it remains the property of the railway at all times.

The New York State Railways—Syracuse Lines—demands only \$1 deposit for the rule book and punch, but this money is returned when the new man is O.K.'d for service. No charge is made for buttons. Each man buys his cap and uniforms at any of six places in Syracuse according to the company's specifications.

The Public Service Railway asks an accepted motorman for \$2 for badge, cap, etc., while a conductor pays \$3 for the same items, plus a bonding fee of \$1.50. The new men must buy their first cap at a specified store in order to get the best, but thereafter they are free to buy from any of the four stores which carry the goods specified by this railway for caps as well as suits and overcoats. Buttons are furnished free by the company.

Another requirement is that of the New York State Railways—Rochester Lines—where the recruit motormen and conductors must make advance deposits of \$17.25 and \$19.75 respectively. Provision is made, however, to accept payment on the installment plan. The Interborough Rapid Transit Company, New York, furnishes and also launders the white duck uniforms used by its subway trainmen.

Classes of Uniforms.—Although gray is used occasionally, the standard color for uniforms is a blue serge with brass buttons and gold or silver braiding or stars to designate length of employment or rank. Such uniforms cost from \$12 to \$15 each, and reinforced pockets are usually provided. As it may be a hardship for a man to own a civilian suit too, or to change clothing between runs, some companies, like the Kansas City Railways, Kansas City, Mo., have eliminated the brass buttons. The company, too, thereby relieved itself of supplying ten buttons per uniform. Now the only special mark on the Kansas City uniform is a star for those men who have been in the service from five to ten years. Older men have a removable lapel button of gold bearing the number of their service years.

The quality of the uniform is generally specified by the railway companies, and the men are instructed to buy from the one or more houses selected. Under the Boston Elevated Railway agreement, however, uniforms may be bought in the open market when meeting the company's specification and inspection, as second-hand suits at lower figures are always available and other clothiers will assert that they can sell new

uniforms of specified quality for less money than the authorized firms. Under the Philadelphia co-operative plan the uniforms are bought from two wholesale houses under contracts approved by a committee of platform men and division superintendents for \$11.75 each if ready made and \$12.75 each if made to measure. Union-made goods are sold at an advance of 50 cts. per uniform.

During the hot and dusty summer season the standard blue uniform is uncomfortable to wear and unpleasant to look at. The use of khaki is to be recommended for summer, but it is still the exception rather than the rule. A shirtwaist or blouse uniform is cool, of course, but is too quickly soiled on most city and suburban lines. The Public Service Railway specifies the same weight of cloth for winter and summer uniforms, but on hot days the men may wear black alpaca coats.

In 1914 the Rockford & Interurban Railway adopted a new summer uniform. The interurban motorman changed from a striped blue and white overall blouse and blue trousers to a gray flannel shirt, worn like a blouse, with soft collar and cuffs, and the usual blue serge trousers. Trainmen are permitted to go without their coats provided they wear invisible suspenders. This uniform is neat, can be washed and kept clean and is very cool during the daytime and warm at night, absorbing perspiration readily. The trainmen wear a silk cap with a visor to shade the eyes. Conductors wear two bands of gold braid around the cap and motormen two bands of silver braid.

Interurban motormen are often seen in overalls just as if they were locomotive engineers, but such a rig should be unnecessary unless the motorman has to handle dusty packages and the like.

Insignia.—It is customary to attach service stripes to the left sleeves of the uniforms of motormen and conductors. The plan of the Public Service Railway, which is typical, is that platform men receive one blue service stripe for each of the first four years of service. One gold stripe is used instead of five blue ones at the end of the first five years, and another gold stripe is added for every five years additional. The seniority of inspectors and starters is indicated by yellow stripes.

On the Pacific Electric Railway a gold stripe is attached every third year, but on the ninth year, a star of gold braid forms the distinguishing mark. Depot masters and other employees not connected with the passenger service wear silver trimmings in place of gold, also stripes to designate length of service.

Going still farther west, we find that the Manila (P. I.) Electric Railway & Light Company not only issues double stripes for inspectors and platform men in the service five years or more, but also a metal diamond-shaped insignia (one or more) for "excellent service," and printed certificates to the same effect.

On a New York interurban railway the caps of the men bear no lettering like "Conductor" or "Motorman," the designation being merely an odd or even number of modest height for each class respectively. Other companies use a differently colored braid without special wording.

On the Brooklyn Rapid Transit System the caps have a band which may be drawn over his title and number when a man is not on duty.

CHAPTER XVI

WAGES AND WAGE AGREEMENTS

Hours of Labor.—No argument is required to prove that the variations in electric railway traffic throughout the day and the consequent variation in the number of cars required make it difficult to secure enough men for the service and yet pay all of them a satisfactory wage. The difficulty of the problem is best appreciated, perhaps, by quoting the opinion of the 1912 committee on training transportation employees of the Transportation & Traffic Association as to practicable ideals for working hours. This committee stated that the hours of service for regular men should be as near to 10 hr. in 12 as could be had with due regard to traffic requirements and the welfare of extra men, while the work of the relief men should be completed in not more than 10 hr. work within 15 hr. The United States is not alone in this difficulty. Paris lines average 10 hr. in 12 hr.; Berne, Switzerland, 9 to 10 hr. in 14 to 15 hr.; Rome, 9 hr. in 13 hr.; London City Council Tramways, 9 to 10 hr. in 15 hr.; Prague, 10 hr. for motormen and 14 hr. for conductors, the high figure for the latter being probably due to trailer operation.

Experience indicates that the committee was correct in its attitude concerning limiting hours for the regular men, for the rush-hour peaks are usually within the 12-hr. period. The actual accomplishments on some large American systems, however, indicate that a skillful timetable man need not demand more than 12 hr. a day of any large number of extra men. As shown in the table on page 399, only 4.5 per cent. out of 1542 runs on one system called for 15 hr., while not a single man on the system had less than 8 hr. work. On this property the older men who do not do platform duty during the evening rush are assigned to traffic-regulation work, which they find more agreeable.

Division of Working Hours.—It should be pointed out here that the runs tabulated were made out in accordance with what is commonly called the two-turn system. Thus one crew works from 5.59 a.m. to 9.01 a.m., then rests to 11.45 a.m. and turns in at 6.55 p.m.; or a second crew has one turn from 5.20 a.m. to 9.26 a.m., and another from 10.51 a.m. to 4.48 p.m. The second crew is among the seniors and so has to serve in but one rush-hour period, whereas the first crew is among the juniors and must be available for both rush hours. Both crews in this comparison spent 10 hr. and 12 min. on the platform, but the seniors

did their stint within 11 hr. and 37 min. while the juniors required 12 hr. and 56 min. If straight runs were used, the number of men required even for the same working hours would involve prohibitive cost.

The ideal, of course, is to divide the turns as equally as possible, and to avoid breaking a man's work into three turns. On the property in mind the longest continuous run does not exceed 7 hr.

At Oakland, Cal., the San Francisco-Oakland Terminal Railways showed in 1915 the following division of runs: straight day, 29 per cent.;

DIVISION OF WORKING TIME ON A LARGE EASTERN SYSTEM

Total runs shown on timetables.....	1542	
Number paying 10 hr. or over.....	1280	or 83.0 per cent.
Number paying 9 hr. or over.....	163	or 10.6 per cent.
Number paying 8 hr. or over.....	99	or 6.4 per cent.
Number of runs finishing within 11 hr.....	254	or 16.5 per cent.
Number of runs finishing between 11 and 12 hr..	348	or 22.6 per cent.
Number of runs finishing between 12 and 13 hr..	453	or 29.4 per cent.
Number of runs finishing between 13 and 14 hr..	417	or 27.0 per cent.
Number of runs finishing between 14 and 15 hr..	70	or 4.5 per cent.
<hr/>		
Totals.....	1542	100 per cent.
Average outside time per run.....		12 hr. 35 min.
Average platform time per run.....		19 hr. 18 min.
Average swing time per run.....		2 hr. 17 min.
129 trippers averaging 1 hr. 56 min.—1.3 per cent. of car-hours operated.		

straight night, 35 per cent.; swing runs, 36 per cent. Only 4 per cent. of the swing runs were divided into more than two parts. The time per run averaged 9 hr. 45 min. a day. Swing runs were laid out to give a man at least 12 hr. between his last run of the day and his first work of the next day. All trainmen are off duty one day each week, enough regular crews being assigned to relief runs to permit this regularly.

The foregoing statements of the association committee, the table from the large Eastern property, and the figures from Oakland are of particular interest when contrasted with the Massachusetts "Nine-hour in Eleven" law which was passed in 1913. The table quoted, it will be observed, has only 16.5 per cent. of its runs within eleven hours, yet it would be difficult to find a plan that reconciled better the practical conditions of railway service and the needs of the men. Fortunately the Massachusetts law had one saving grace—it permitted the men to waive the law if they did so according to formal agreement.

The arbitrators in the Worcester-Springfield case in the year 1913 interpreted the Massachusetts law in this fashion: 20 per cent. of the runs to be completed on the 9-in-11-hr. basis; 20 per cent., $9\frac{1}{2}$ hr. in 12 hr.; the remainder to be divided as follows: 9 hr. in $11\frac{1}{2}$ hr., 9 hr. in 12 hr., and $9\frac{1}{2}$ hr. in 11 hr.

On the Boston Elevated Railway, in timetables made in May, 1914, 40,600 trips were called for, involving 5177 scheduled and extra runs. The midday runs were arranged so as to include the morning and afternoon peaks so far as possible, while the early and late runs included only one peak, so that in all the elapsed time was kept at a minimum. Thus an early run might start at 4.50 a.m. and extend to 3.02 p.m. with a lunch relief between 10.15 and 11.45. Another run at the end of the day might be from 3.25 p.m. to 6.32 p.m. and from 8.15 p.m. to 1.32 a.m. The Boston company has no straight tours of duty of 9 hr. without a break, the longest run being 6 hr. 20 min. As a rule the men prefer a short noon relief and a correspondingly short day.

On the Bay State Street Railway nearby this question was adjusted by arbitration in December, 1914. The company agreed to recognize the principle of dividing the total number of hours of the schedules into runs of 9 hr. to be completed in 11 hr. so far as possible. Not more than 20 per cent. of the runs are to be completed in excess of 12 hr.

In the Chicago arbitration of 1915 the arbitrators decided that all runs on Sunday should be straight time and should not exceed 9 hr.

Another example is afforded by the Municipal Railway System of San Francisco. The men on this line are classed as civil service employees and receive \$3 for 8 hr. actual service. In discussing the demand of the men that they be subject to call no more than 10 hr. a day for 8 hr. work, the superintendent pointed out that this would increase the cost of platform service at least \$90 a day, or more than 23 per cent.

In some cases, as on the Joplin (Mo.) & Pittsburg Railway, the agreement with the employees provides that the elapsed hours "may be extended a reasonable length of time" on July 4 and other days of heavy travel, although an overtime rate is paid for these periods.

The Philadelphia Rapid Transit Company's basis for car schedules, as recommended by the co-operative committee of platform men and division superintendents, is that regular runs shall constitute from 9 to 11 hr. of service all to be completed within a maximum of 14 consecutive hr. Deviation from this rule is permitted only at the request of the men. If the actual time of the run is below 9 hr. (Sundays) timetables excepted, the man is paid for 9 full hr. In the summer of 1914, 23 per cent. of the runs were early straights, 34 per cent. late straights, 39 per cent. early swings and 4 per cent. late swings. About one-fifth of the men were extras. The seniority basis obtains in assigning runs.

Assignment of Runs.—Runs for the regular men are usually assigned in the order of seniority, the oldest man having the first choice and so on. This privilege is one much prized as may be deduced from referring to the city run layout in the chapter on "Timetables." On some systems the men are allowed to trade runs, a practice, however, which is liable

to cause confusion to the timetable department. If men are allowed to trade runs the trades should hold good for a reasonable length of time, say for the life of the particular timetable and not be changed from day to day.

Runs for extras where a daily or weekly guarantee is not given are assigned most frequently according to the rotating daily list method, that is to say, each man is employed in turn for a specific number of hours after which he goes to the bottom of the extra list.

On the Bay State Street Railway seniority applies to all passenger and service cars except freight and express cars. Schedule changes are to be posted 96 hr. before going into effect, the picking of runs to take place within from 60 to 24 hr. before operation begins. The men may have the chance to exercise choice of runs three times a year. Vacancies through resignation of regular men must be posted within five days. Temporary vacancies are filled from the extra list for not more than thirty days. Crews who lose an extra trip scheduled as a part of one day's run are to have seniority preference in picking a substitute.

The Boston schedule of December, 1913, called for a general selection of runs on the seniority basis to be made at least three times a year. All tables are to be posted two days before the picking time and at least four days are to be allowed in which to pick runs. The time for picking runs is to close 24 hr. before the timetable goes into effect. Emergency runs may be assigned for a period of seven days. On the United Traction Company runs are picked twice a year—in the spring and fall. On the Empire United Railway schedules which show run numbers, hours and minutes each run works are posted five days before going into effect.

The comfort of the men depends very largely upon the skill with which the schedule maker compiles his timetables; and if he finds there is very much trading of runs he should make it his business to learn what motives the men have in making trades, and then see if he can work out the runs to improve the less popular ones with some slight shifts. For example, the older family men may be willing to work longer hours on swing runs if they can combine more earning power with less service during the rush hours. Again, the owl car man who starts at 5 p.m. and works 10 hr. in 11 hr. to 4 a.m. may prefer to lengthen his run to 6 or 7 a.m. because at 4 a.m. his folks are abed, he can get breakfast only with difficulty and in a few hours his sleep would be broken by the rising of the other members of the household. If his run brings him home by breakfast time he eats with his family and has earned payment for a morning rush-hour tripper as well.

Misses and Loss of Seniority Privilege.—Each company has its own ideas about disciplining the men in connection with their seniority. If a man reports too late for his regular run, it is logical to penalize him to the

extent of losing a round trip. But it is hardly fair to deprive a motorman of his seniority rights unless he has accumulated a host of demerits. The Public Service Railway does not even allow the suspension of a man to affect his run unless he has been late four times in a year.

As to lateness in general: Due allowance should be made for giving ample notice by telephone; for illness; for blockades and for accidents.

Leave of Absence.—Diverse practices obtain with regard to absences, illness of regulars, etc. As to Europe: the law calls for one day off in seven at Paris; one in fifteen at Rome; one in seven at London; one in seven at Glasgow; one day in every ten at Prague.

In Boston, any blue-uniformed man may receive, if he so desires, at least one day off in fifteen. So far as practicable, employees who do court work are to receive full compensation. In case of illness, if there is no immediate prospect of a man's return at the end of thirty days, his run is to be advertised to be bid for by men below on the seniority list operating on the same line. Men who return after illness, however, are to be restored to their old runs.

On the Bay State Street Railway normal leave of absence is limited to thirty days.

In its arbitration decision rendered Feb. 11, 1914, relative to the Indianapolis Traction & Terminal Company the Public Service Commission of Indiana, suggested that a book be maintained at each carhouse in which the names of men who wish to be off duty should be registered, and absence, if permitted at all, should be in the order of registration. If all requests could not be granted, those who had been off duty within the last sixty days should be first refused. The Commission also decided that a motorman or conductor was to be allowed at least one Sunday off a month as designated by the company.

One week's vacation with pay is granted by the Public Service Railway to inspectors and starters each year.

Rates and Methods of Wage Payment.—With very few exceptions the platform men and other traffic workers on American electric railways are paid by the hour. This is the fairest way because a fixed number of working hours for any appreciable part of the force is financially impracticable. The best that can be done is to limit the number of consecutive hours forming a 10-, 11-, or 12-hr. period in which a man may be called to serve say 8, 9, or 10 hr. respectively. Such limitations have been fixed by law, by arbitration and by agreement with employees and their organizations. Necessarily they differ in accordance with the local traffic and labor conditions, for the question is not one of abstract justice but of expediency. All agree that it would be ideal to have an exact number of working hours, but no one has yet discovered how to do it and keep the railway running. The rates per hour also vary greatly

and must necessarily do so in view of the wide difference in labor conditions and cost of living in different sections of the country.

Flat Rate, Day Rate and Mileage Rate.—Only a very small proportion of the roads pay a flat rate per hour or diem. Among agreements made during 1913 and 1914 were those of the United Traction Company, Albany, N. Y., for 28 cts. an hour and of the Illinois Traction System for 33 cts. an hour.

However, on Dec. 1, 1915, the Illinois Traction System adopted a mileage payment plan for two years. The basic condition is a 9-hr. minimum day during which a passenger crew must make 200 miles. Runs in excess of 200 miles are to be figured at the rate of 22.2 miles per hour, for which $1\frac{1}{4}$ cts. per mile of excess will be paid the first year of the contract and $1\frac{1}{2}$ cts. per mile of excess will be paid the second year of the contract. Trainmen in order to obtain any excess pay or be paid on a mileage basis, must run at a speed to exceed 22.2 miles per hour while on duty. In other words, a train crew running 250 miles in 10 hr. will be paid for 10 hr. at 33 cts., or 222 miles, and in addition will receive $1\frac{1}{4}$ cts. per mile for the additional 28 miles.

A flat day rate of \$3 is in vogue on the San Francisco Municipal Railway, but several roads pay by the day on the assumption that the men in each class will work, say 10 hr. On this basis the Danville (Ill.) Street Railway & Light Company pays \$2.10, \$2.20 and \$2.50 for first-, second- and third-year men, respectively.

Discussion of Payment Methods.—No argument should be needed to prove the absurdity of the flat rate. Reward for loyalty alone would justify a railway in paying more to its older men for their staying, as they are saved the cost of breaking in new men at \$25 to \$100 each. But there is plenty of evidence that experienced men are worth more money because of their fewer accidents and more skillful handling of the car. It would be rare indeed if a new motorman did not suffer the baptism of at least one accident during his first year; and the raw conductor rarely escapes some trouble until he has learned to keep his head. Of course, the demand for a flat rate comes from the one-year and two-year younger and hot-headed fellows who unfortunately are too numerous on many of the larger systems.

Better than arguments are figures from practice. Data submitted by the Scranton (Pa.) Railways in May, 1914, showed that the annual accident expense of the one-year, two-year, three-year and four-year plus men were respectively \$236.81, \$146.63, \$100.61, \$95 and \$48.47 each. A similar table prepared for the year 1911 by the Public Service Railway, Newark, N. J., showed that the annual accident expense of the one-year, two-year, three-year and four-year men averaged \$202.98, \$135.57,

\$83.23 and \$47.35. These figures do not include repair-shop expense on account of the accidents.

An examination of the following figures compiled by the Mobile (Ala.) Light & Railroad Company will also show that the men in the second year of service were considerably below the full qualifications for their work and were not entitled to the same rate of pay as men longer in the service.

PERCENTAGE STATEMENT OF SETTLEMENTS MADE ACCOUNT OF ACCIDENTS THAT OCCURRED IN 1913 AND 1914, MOBILE LIGHT & RAILROAD COMPANY

	Percentage of				Average cost of settlements per car-hour per man	
	Total trainmen		Cost of settlements			
Grade of service of trainmen	1913, per cent.	1914, per cent.	1913, per cent.	1914, per cent.	1913, cents	1914, cents
First year	43.6	37.3	57.25	75.73	0.0447	0.0446
Second year	16.0	17.6	29.18	15.11	0.0621	0.0189
Third year	11.1	12.8	3.74	0.48	0.0114	0.00083
Fourth year	8.0	9.5	4.26	1.89	0.0139	0.00433
Fifth year	4.1	4.7	1.67	0.15	0.0139	0.000719
Over five years . . .	17.2	18.1	3.90	6.64	0.0077	* 0.0081

It is probable that there is very little if any gain in efficiency after the fifth year, so that it is proper that a platform man should receive his maximum wage in that year or soon after.

The problem of holding a man after he has attained his highest usefulness is not so much a matter of wages as of special privileges and welfare work. Seniority choice of runs is highly prized, for example, because the veteran finds pride as well as convenience in being allowed wide freedom of choice in picking his working time. The older men also get most of the extra pay jobs like teaching and snow fighting. Again, welfare work in the form of free insurance or pensions gives a man a stake in the property which naturally increases with time.

What has been said about compensation is intended to apply to all men. But something special should be done for the exceptionally good men. The man who accumulates the greatest number of merits, who is in especially difficult or skilful service, who has no accidents and who operates his car with the least intake of energy deserves a reward regardless of seniority. As not all such men could be promoted or would be temperamentally fit for commanding others, various forms of bonus systems have been devised as hereinafter described.

Extra Men and Guaranteed Wage.—There is no wisdom in training a man, usually penniless, at appreciable cost and then expect him to re-

main in service as an extra at uncertain wages. Hence, many companies guarantee a minimum wage, say from \$1 to \$2 a day or else a certain amount a week.

If extras are paid by the week to cover a minimum number of trips they can be used without further cost to handle one-trip holiday and Sunday peaks as church and concerts. The practice of paying a guarantee to extras not only has the great merit of holding the new men, but of encouraging more car service. The extras would not earn their money if used during the rush hours only and consequently the schedule maker feels encouraged to use them up to the limit of their paid time at least.

On the Ottawa Street Railway extras who report for duty at 6 p.m. are allowed 1 hr. time if not put on a run and the same is true for 6 a.m.

A number of companies use the extras for car cleaning and miscellaneous jobs. The extras of the Portland (Oré.) Railway, Light & Power Company distribute lighting bills at a saving over mail, clean cars, take register readings, remove transfers from boxes, etc. The extras get 25 cts. an hour for platform work and 22.5 cts. an hour for the odd jobs.

So far as the regular men are concerned, their runs are generally arranged to give them the desired or permissible number of hours work, but in a few cases a guarantee is made that they will receive, say, 9 hr. pay as on the Barre & Montpelier Traction Company, where this provision applies even to Sundays.

The Empire United Railways' freight and package crews get 9 hr. pay at least; Buffalo, Lockport & Rochester pays 10 hr. for 8 hr. work by regulars.

On the Annapolis Short Line men who are called out get $2\frac{1}{2}$ hr. minimum pay whether used or not. Men are paid for 10 hr. if they have straight runs of 8 hr. (four 2-hr. trips) or for 11 hr. if they are night men who make three straight runs with a $2\frac{1}{2}$ -hr. swing before making fourth trip.

Payment for Non-platform Time. Meal Reliefs, etc.—On many properties men are paid for platform time only, but they must report 5 or 10 min. in advance of platform service. The 5 or 10 min. leeway is required to permit a substitute crew to get cars, transfer pads, etc., in case the regulars do not appear. Some companies pay men for the make-ready periods. This is done in Boston, including time before the first run of the day, for work at the end of the day or after reliefs in excess of one, 10 min. being granted conductors and 5 min. to motormen. The Bay State Street Railway arbitrators, December, 1914, ordered that all men were to be paid from the time they report for duty until they are relieved. The United Traction and other companies pay on delayed runs until a man is relieved and the relief crew is paid from the moment of taking the car.

The Public Service Commission of Indiana in its decision of Feb. 11,

1914, on the Indianapolis Traction & Terminal Company refused compensation for the 10-min. make-ready before taking out a run and also refused extra compensation for overtime. It decided, however, that men who were unavoidably delayed by accident or blockade should not be penalized beyond the loss of the run missed, at the discretion of the company. The Buffalo, Lockport & Rochester (interurban) Railway allows 45 min. to get the car to the city, although 25 min. is usually enough. On the Bay State Street Railway, which is really a network of city and suburban systems, men are allowed traveling time if they are sent to work at a place beyond their usual reporting station.

The men of the Terre Haute, Indianapolis & Eastern (interurban) Traction Company are paid for time in deadheading to and from points where they are sent for runs. The Indiana Union pays one way only; up to the end of relief time but not for deadheading beyond that time as the men can sleep at the relief point. Men called for a run or held for a run and not used are paid a minimum of 1 hr. If held more than 1 hr. they are paid for the actual time held. Three hours is the minimum time for which any man who takes out a run is paid; men who are paid the minimum of 3 hr. for a run remain at the head of the extra list unless they have had a previous run the same day. Nine hours is the minimum time paid for any regular schedule run. No regular schedule run is more than 12 hr. and 15 min. Regular men who are taken off runs and placed on some extra runs for the day are paid not less than the regular pay of the run.

According to the agreement which the Joplin & Pittsburgh Railway has with its employees a trainman with a regular run who is called from one town to another to work an extra run is paid deadhead time going, and after arriving, until his extra goes out, then deadhead time after he gets off the extra run until he returns. The deadhead time between the time off the extra and the time he returns is only such time as intervenes before the departure of the first car. If a man lives in another town than where his regular run is listed, then his deadhead time would be from where he lives. Regulars who are assigned to shorter runs than their customary trips are to be paid as for the longer runs; also if they are assigned to extra runs it must be for not less than $1\frac{1}{2}$ hr. pay, and if called before 6 a.m. for 2 hr. pay.

United Traction Company, Albany, N. Y., pays for lay-overs between reliefs and deadhead riding to other points where runs are to be taken.

Another leak in the electric railway pay-roll is payment for luncheon time or "meal relief." Usually city runs can be laid out so that the luncheon period of most men will come on their own time between turns as a matter of course, while on suburban and interurban lines this is often cared for by the lay-overs. At Hampton, Va., working time

includes a 30-min. meal relief and deadhead running. On the Pittsburgh Railways a maximum of 90 min. lunch time is allowed, 30 min. of which is paid for by the railway. Under the Bay State agreement the company agrees to provide a meal or let the man go home for one if it wants him to run as an extra after 7 hr. continuous work. Otherwise it makes a dinner and supper allowance of 1 hr.

Overtime.—In Canada, where a strong prejudice still exists in regard to Sunday running, some railways which do operate on that day pay extra. Thus the Ottawa Street Railway pays 2 cts. an hour extra, the Halifax Tramways 3 cts. to 4 cts. (last for three-year men), while the Lethbridge Municipal Railway gives 9 hr. pay for 7½ hr. Sunday work and pays time and one-half for service on public holidays.

Overtime rates are not popular on American electric railways, and with skillful management the necessity for overtime itself should scarcely arise. The Public Service Railway pays men who volunteer for extra service after completing day's work a rate of 37.5 cts. per hour whether regulars or extras, this being equivalent to one and one-fourth to one and one-half overtime rate according to class.

The Buffalo, Lockport & Rochester Railway pays time and one-half for overtime; and the same for extras beyond 10 hr.

As to other interurban lines the Aurora, Elgin & Chicago Electric Railway pays the men on its Fox River division 5 cts. an hour extra for overtime, but does not count as overtime delays in completing regular schedules.

Time and a half for overtime exceeding an agreed working day of 9 or 10 hr. is what labor usually asks for. This demand was rejected in the Indianapolis arbitration decision rendered by the Indiana Railroad Commission, February, 1914, but it was granted to the union by the United Traction Company, Albany, N. Y., in a contract running for two years from July 1, 1914, in a year-to-year contract with the Joplin (Mo.) & Pittsburg Railway, in an agreement with the Cumberland (Md.) & Westernport Railway and on other properties.

The arbitrators in a wage dispute between the Pittsburgh Railways and its men refused 10-hr.-day pay for 8-hr. night work on the ground that such labor is an uncontrollable requirement of the public. It knew of only one system where night men received extra pay. The same reasoning applied to Sundays on which the men often chose to labor because it is generally easier to handle Sunday traffic since almost every one is in holiday humor and not in the usual hurry. The men, therefore, get more relief from a week-day layoff than otherwise. As in some instances, however, the Pittsburgh Railways had allowed 10-hr. pay for 8-hr. Sunday work, the arbitrators did not alter this provision.

The arbitrators in the Boston Elevated Railway case, December, 1913,

refused extra pay for night work. They said it was fair to assign the younger new men to this service because of less dangerous operating conditions. However, if the outside limits of a man's run exceed 12 hr. he gets 25 per cent. overtime pay for the first excess hour or fraction thereof and 50 per cent. for the second excess hour or fraction thereof, the same rate continuing for additional hours. On the Bay State Street Railway the arbitrators granted $8\frac{1}{4}$ hr. pay for 8 to $8\frac{1}{4}$ hr. work, and 9 hr. pay for $8\frac{1}{2}$ to 9 hr. work. Runs from $9\frac{1}{4}$ to $9\frac{1}{2}$ hr. are paid for at the $9\frac{1}{2}$ -hr. rate. A special rate is granted for time in excess of the 12-hr. outside limit. All men who run an extra after the completion of a regular run are paid for continuous time. On the United Traction Company it was agreed to add minutes up to the end of the week if the employees so elected.

Miscellaneous Pay Allowance.—On the Bay State Street Railway time lost in looking up or reporting accidents is figured at the regular car rate for all reports required before the completion of the day's work, and all others are paid for at 10 cts. each.

It is sound practice to pay men for the time spent in testifying in court concerning accidents in which they have been engaged.

Work on Service Cars.—The Public Service Railway pays passenger motormen and conductors regular rates when they work on service cars, whereas the so-called "trolleyman" gets 20 cts. an hour. On the whole, it is not customary to pay the operators of such cars transportation department wages unless they are under the jurisdiction of that department.

Other Forms of Extra Pay.—Other forms of extra pay are considered in Chapter XIX.

The Philadelphia Rapid Transit Co-operative Wage.—The Philadelphia Rapid Transit Company's co-operative plan for handling the wage question is so different from that generally employed that it may well be described in some detail. Under this plan 22 per cent. of the gross passenger receipts is set aside in a separate fund for use in payment of wages, \$20 a month pensions for sixty-five-year men in service more than twenty-five years and \$500 death benefits to the motormen and conductors.

The success of the plan is apparent from the fact that by July, 1914, three years after its adoption, 47 per cent. of the men were receiving the maximum pay (30 cts. an hour) granted after five years' service. In August, 1911, at the time the 22 per cent. plan was adopted the men were assured that while they would share in any advance of gross earnings they would never get less than the wages they started with. The company, however, has enjoyed such a growth in gross earnings that the average increase in the wages of the men in July, 1916, was 39 per cent. as compared with August, 1911.

The following table will be interesting in this connection:

RATIO OF WAGES OF TRAINMEN TO TRANSPORTATION REVENUE

	Total revenue from transportation	Wages, conductors and motormen	Wages as per cent. of revenue
(1) Bay State Street Railway Company...	\$9,276,882	\$2,035,657	21.9
(2) All street railways in Massachusetts...	38,908,061	8,428,720	21.7
(3) All street railways in New England ...	54,130,142	10,819,328	19.98
(4) All street railways in United States ...	520,184,773	95,451,625	18.35

In the table items Nos. 1 and 2 are for the year ended June 30, 1914, as reported to the Massachusetts Public Service Commission and given under the headings, "Total Revenue from Transportation" and "Wages of Conductors, Motormen and Trainmen."

Items Nos. 3 and 4 are from the 1912 census report on street and electric railways. The total revenue from transportation is made up of the following revenues: Passenger, parlor, chair and special cars, freight, mail, baggage, express and milk, and other transportation revenue.

Foreign Wages.—In conclusion, it may be instructive to quote a few foreign wage rates as presented in 1914 by W. D. Mahon, president of the Amalgamated Association, before the American Federation of Labor. The facts given relate, of course, to conditions before the war.

Conductors' earnings on the continent are somewhat higher than those presented, especially in tourist centers, owing to the custom of tipping them ($1\frac{1}{5}$ to $1\frac{1}{4}$ cts.) for courtesies to passengers.

On the transportation lines of Paris some employees are paid by the month, some by the day, and others by the hour. In the train service there are five grades of pay. In the fifth class men receive 165 francs (\$33) a month; fourth class, 175 francs (\$35) a month; third class, 185 francs (\$37) a month; second class, 195 francs (\$39) a month, and first class, 200 francs (\$40) a month. The entrance to these various classes is fixed by time of service, but depends upon vacancies in each, so that promotion from a lower to a higher class, with resultant increased pay, can come only when a vacancy occurs.

The wage at Berne, Switzerland, for conductors starts at 150 francs a month, or \$30, and reaches 220 francs a month, or \$44, in ten years. The beginning wage for motormen is 155 francs a month, or \$31, and after ten years the maximum is 230 francs, or \$46 a month.

The investigation of the conditions in Italy was interrupted by the outbreak of the war in 1914. Some figures, however, were obtained in Rome and Milan. In Rome there are one steam and four electric tram lines. One of these is owned by the municipality, which will take all of them

over in 1920. The wages on the private line begins at 64 cts. a day, and the maximum wage after ten years' service is 94 cts. a day. The wage on the municipal road is 10 cts. a day more than on the privately owned roads, but other conditions are about the same.

In Great Britain only two cities were investigated, London and Glasgow. The wage for the motormen and conductors on the lines of the London County Council Tramways is from \$1.20 to \$1.56 per day.

In Glasgow the wages per week for motormen and conductors vary from \$6.48 for the first year to \$8.16 for the seventh year and \$8.40 thereafter.

In conclusion, Mr. Mahon said:

"Nor can there be any comparison between the wage of the European tram employee and his brother in the United States. From the viewpoint of the purchasing power of a dollar it has been estimated by careful observers that the cost of living in various parts of the United States is 25 per cent. to 65 per cent. higher than it is in various parts of western Europe. The difference in the money wage of street-railway men of these countries is much greater. The highest wage paid to any body of tramway workers in Europe is safely 100 per cent. less than the rate paid in this country in the same occupation, and we found this to be the fact both on private and municipal systems."

From the worker's point of view the only saving grace about the foreign tramway situation is the extensive development of co-operative buying and in Switzerland and Germany particularly, insurance against sickness, injury and old age.

Timekeeping and Paying.—In keeping the time of trainmen some companies use the figures shown on the time sheets based on the report of the dispatcher, but others have time sheets on which the men sign for the number of hours made during the day, this being checked up by the dispatcher or station foreman against the timetable. The 1914 committee on employees of the Transportation and Traffic Association recommended that sheets for each division be made and posted by the station foreman for both motorman and conductor, showing the number of hours of each run; that extra sheets be made out for extra runs and that the time that the crews leave and return to the station be marked upon these sheets by the timekeeper or station foreman. These sheets should then be turned over to the timekeeping department for check against the timetables, the extra trips being approved by the station foreman and superintendent of transportation or division superintendent. The same sheets should also show any allowances made for reporting time or "deadhead" time from station to point of relief and all other allowances, all to be approved by the proper transportation official.

While a few railways use time-clocks to check a crew's running time, it is a strange fact that the standard time-clock system has not been tried in checking the outgoing and incoming time of each motorman and

conductor. Such a card could be provided with spaces to show the run and train numbers for the given time registrations, and also for any remarks on deadhead, make-ready or other time allowances. These cards could be used as the primary records in making up the pay-roll, being checked up against the timetables only in case any doubts or disputes arise.

The self-printed cards used in the later form of coasting recorder may also be used to figure actual platform time with any desired notation for allowances.

In computing fractions of an hour, most companies figure according to the exact minute. In the Boston Elevated Railway agreement of December, 1913, however, the board of arbitration ruled that the company shall give the man the benefit of the quarter hour into which his work extends whether he completes it or not. The full 30 min. is figured in the case of runs of 8 hr. or more platform time but less than

N.Y.C. 948		RECORD OF CREWS																						
Runs	RAIDERS	CONDUCTORS	RAIDERS	MOTORMEN	TABLE TIME				STANDARD		Table Allow.		SPECIAL ALLOWANCE		OVERTIME		EX. SERVICE		DEDUCTED		TOTAL		REMARKS	
					OUT	IN	OUT	IN	hrs	Mins	Mins	hrs	Mins	hrs	Mins	hrs	Mins	hrs	Mins	hrs	Mins	hrs		Mins
1																								
2																								
3																								
38																								
39																								
40																								
Line		Date		Schedule No.		Patch																		

FIG. 117.—The basis of the roll call made out at a depot, Brooklyn Rapid Transit Co.

8½ hr., and of runs not exceeding 12 hr. outside time with 9½ to 10 hr. platform time.

Ordinarily the platform men are paid by the week, but it is a curious fact that on some railways the men are permitted to pay themselves by the day. The principal reason assigned by the companies which follow this practice is that it saves the time of the company and the men and also is a convenience to the employee as it gives him cash for his work at the end of each day. It is hard to see how such a system can avoid causing many misunderstandings if the time accounting is complicated by reporting, deadhead, overtime or other allowances.

A modified daily self-payment plan is used by the Washington Railway & Electric Company. Payment is made by the depot clerk (receiver) except where crews finish their day's work at some distance from the carhouse in which case the conductor pays his motorman. The conductor enters on his day card his own pay and that of the motorman.

These figures are checked by the depot clerk by means of his "on and off" sheet. The amount of pay and the name of each conductor and motor-man are entered by the depot clerk on a train register or pay-roll for final check at the treasurer's office.

The rates of pay are usually raised in accordance with the seniority schedule. On one large Eastern property, however, the accumulation of a certain number of merit marks advances a man's seniority classification by six months. On a Southern property a somewhat different policy is followed. Here the increase in pay due to the earlier classifications is allowed, but is held back for six months on the theory that the plan will encourage the men to establish savings accounts with these sums and thus to learn thrift. Whether this is the result in practice is doubtful. Usually, bonuses and extra wages are paid promptly when due.

Agreements with the Men.—On most electric railways of the United States the relations between the company and its employees is a strictly man-to-man affair, whereas the German and other Continental roads make individual contracts for an eight-week probation period while regular men must sometimes give three months notice, yet the company gives none. A strike may forfeit an employee's deposit. Such severe conditions have never existed in America.

Despite the strong feeling that electric railways have toward interference with their business, they cannot ignore the fact that this is the day of collective bargaining and co-operative management. Whether the bargaining shall be conducted through the medium of employees' committees without any organization or through the representatives of a labor union, domestic or foreign, is still within the power of many railways to decide.

Collective bargaining as such would have little terror for the railway if it did not threaten inroads on the discipline so necessary to give safe and unbroken service. Disputes concerning financial matters may be settled far more readily than those that question the wisdom of operating rules and the penalties set forth for breaking them.

It is sound policy for the railway to encourage its men to act unitedly and openly for their mutual interest rather than to sulk over their grievances in carhouse assembly rooms or saloons. This does not mean a formal organization with dues, paid officials and a war chest, but a plan whereby the management and its men are kept in touch with each other on every matter of mutual interest.

Senior Committee Go-betweens.—An excellent plan for large and small properties, whether unionized or not, is that followed on the principal road in Berlin, Germany. Here every division is represented by a committee of the older and more staid platform men, most appropriately called "Vertrauensmaenner" (trusted men). These committees serve

two functions: They weigh the merits of all complaints made by the individual platform man before presenting his case to the management; and on invitation they give the management their viewpoint of a proposed rule or new equipment. An example in point was the introduction of clocks to check the proportion between the energy-using and schedule periods. This radical change was successfully handled by first explaining the purpose of the device to the committeemen who in turn informed the men on their respective divisions. Surely there is nothing derogatory to a management in making use of the combined experience of its men and securing their good will in this manner.

Grievance committees on American railways are often sporadic affairs created in a night because of some real or fancied trouble and dissolved when the matter has been settled. It would be well to have permanent committees elected by the men to confer at regular intervals with the higher officials as is already done in the formation of safety committees. The existence of such a committee will serve as a brake on the hasty subordinate officer since he knows his action is subject to review.

Co-operative Boards.—The need for formal co-operation even when the men are unionized was appreciated by the arbitrators who adjusted in November, 1914, the differences between the Pittsburgh Railways and its platform men. They recommended:

"That a board of co-operation be formed as follows: One man to be elected at each carhouse by secret ballot by the motormen and conductors in service more than six months. These twenty men, together with the general manager or superintendent of transportation and such other representatives as the company may elect, not to exceed five persons, to constitute a board of co-operation. This board to meet at least once every month, to suggest and discuss methods of improving the service, of rendering it safer to the company, and in general to suggest ways and means of avoiding misunderstandings between the men and the company, and promoting good feeling on both sides. This board also to hear grievances and complaints that may be made by the men or the company and to suggest methods of reasonably meeting them. The election for the following period to be held at each carhouse once each year under the direction of the local committee of motormen and conductors and a local superintendent. The trainmen to be paid by the company at their regular rates of wages for all time employed by the men in attending the meetings."

The plan thus suggested for Pittsburgh has been anticipated on still broader lines by the Philadelphia Rapid Transit Company. Following most destructive strikes in 1909 and 1910 this property was re-financed by new interests. The new management permitted the men to belong to either of the two unions in existence, but independently of the unions the assent of the men was obtained to a co-operative plan which was inaugurated August, 1911. Outside of the financial arrangement concerning wages, etc., as discussed elsewhere, this plan provided for a co-operative

committee composed of a motorman or conductor from each division, the management being represented by the superintendent of each division, together with the superintendent of transportation or his representative. At first, the division superintendents were instructed to select a motorman and conductor from each depot without regard to their factional affiliations. In April, 1912, the pair of depot representatives were elected by vote of the platform men. Following this election it was decided that the co-operative committee would include two representatives from each depot, the candidate receiving the highest vote to be known as committeeman No. 1 and the candidate receiving the second highest vote to be known as committeeman No. 2. This afforded direct representation not only to the majority at each depot but also to the largest minority. In June, 1913, a secret-ballot-voting machine was adopted to count and certify to the returns. There was also established a vote committee consisting of three motormen or conductors of the co-operative committee, no one of whom shall be a representative of the depot at which the vote is taken.

A candidate must have been in the service for two years or more and be assigned to a regular run. The power of recall is in the hands of the motormen and conductors, in that every twelve to fourteen months the committeemen must stand for re-election.

The results of the co-operative plan have been excellent. The public receives more adequate service than formerly, while the improvement in the courtesy of the motormen and conductors is indicated by the fact that the number of complaints decreased 80 per cent. during the first three years of the co-operative plan. Also with 20 per cent. more passengers carried than just before the co-operative plan, the number of accidents decreased 25 per cent. and the number of fatal accidents decreased more than 35 per cent. A part of this improvement was due to better cars but there was also a great improvement in the human agency.

Under the co-operative plan the old practice of discharging men as a punishment and thereafter re-instating them through the influence of others, irrespective of the merits of their cases, is not now permitted. Discharge is used only as a last resort, the co-operative committeemen being most effective in preventing the discharge of motormen and conductors by advising them to mend their ways and by assisting in presenting all the facts to the superintendent of transportation in order to insure a thorough understanding of the true merits of the case before final action is taken.

The best evidence that this method of discipline is effective is found in the decreased number of men discharged. In 1911, 1635 men were dismissed, or one in every five; in 1912, 855 were dismissed, or one out of eight; in 1913, 536 were dismissed, or one out of every twelve; in 1914,

334 were dismissed, or one out of twenty; in 1915, 142 were dismissed or one in forty-five; in 1916, the number was 117, or one in fifty-five. Furthermore, there is a smaller number of men now resigning from the service. In 1911, 1390 men resigned; in 1912, 913; in 1913, 956; in 1914, 337; in 1915, 142 and in 1916, 275. The increase in 1916 represents the attractions of the high wages paid by the munitions factories and other industrial establishments in Philadelphia. The year in each instance is the twelve months ended May 31.

Individual Contracts.—Another plan of labor agreement, known as the individual contract, has been tried recently by a few roads. One of these is the New York Railways, which put it in operation during September in 1916, following a partial strike on its lines. A very similar agreement had been introduced a short time previously on the Interborough Rapid Transit Lines, controlled by the same interests as the New York Railways. The individual contracts have also been adopted by the Indianapolis Traction & Terminal Company and several other lines in Indianapolis. The contracts on the New York Railways read as follows:

"1. The New York Railways employs the undersigned for the wages and hours set forth on the annexed schedule from September 3, 1916 to Aug. 31, 1918.

"2. The undersigned agrees to work for the company in such positions as may be assigned to him from time to time (provided there shall be no reduction in position except for good cause) for such wages and hours and such periods.

"3. It is further agreed that if the company shall increase the wages or change the hours set forth on schedule, the undersigned shall have the benefit of such increase or change notwithstanding this agreement to the contrary.

"4. If, after five years of service in any one class, for physical causes beyond the control of the undersigned, he shall be assigned to a lower position, he shall then receive at least the low rate wages on the schedule of the class from which he is transferred."

The contract is signed for the company by the vice-president and general manager and also bears the signature of the employee with his pass number.

Contracts with Unions.—At this writing, about 200 electric railways of the United States and Canada have written agreements with the Amalgamated Association alone, often covering not only the platform men but other men in and out of the transportation department. This plan is much more effective than craft organization in enlarging the power and income of the union. The Amalgamated Association of Street and Electric Railway Employees is an unincorporated union, which is practically without a rival in this field of labor except the Brotherhood of Railway Trainmen on some interurbans. These bodies have caused more than one strike on questions of jurisdiction, as in Central New York during 1915.

A comparison of the various agreements made with the labor unions

will show that they differ in many respects since each is a compromise. In general, the railway agrees to treat with the properly accredited officer and committee of the labor union on all grievances, the committees consisting of local employees. Generally outside paid officials of the union are called in only if the committee cannot make satisfactory terms. In a few of the contracts made the company has agreed to suspend or discharge those employees who have failed to pay dues to the union without giving written notice of the desire to end membership, thus transferring to the railway the odium of dues collection. The railways, as a rule, however, have nothing to do with the internal affairs of the union.

The agreement with the Bay State Railway differs from most others in not obliging the company to agree to any arbitration, according to the union procedure, of suspended or discharged men in the service less than six months. This procedure, of course, varies with the size and organization of the property. On a small property like the Joplin & Pittsburg Railway the decision of the head of the department concerned, if unsatisfactory, is taken up for appeal by the local union committee to the general manager of the railway between 9 a.m. and 6 p.m. of any business day. If this conference proves unsatisfactory the committee still has the right of further appeal to the president, vice-president or secretary of the company within a limit of five days beyond the first Monday of the month. If found innocent the employee is to be paid for all time lost, but even if guilty he is to receive compensation for any time in excess of the five days' grace beyond the Monday allowed the highest court of appeal.

On a large property like the Bay State Street Railway the successive courts are the local division superintendent, the general superintendent, the general manager and, finally, arbitration.

A number of the contracts, like the Bay State, call for giving a certification of record to the employee, with a recommendation when his record permits.

Perhaps the most surprising inconsistency in the demands of the men is in flat rate versus sliding scale for wages. Sometimes one is demanded, sometimes the other. However, the logical sliding scale is more prevalent.

Other details of contracts with employees, referring to methods of computing time, to hours, to special service and special pay, to seniority choice of runs, absence rules, etc., are discussed under the heads relating to those subjects. Among miscellaneous provisions in the Bay State agreement is that men shall retain their rate of pay, although losing their seniority, when transferred from one carhouse to another; also that any man promoted from the platform is to receive a year in which to try the new work without loss of rating. Getting down to minute points, the

agreement says that except in emergencies where the conditions do not warrant the employment of a starter or announcer, a conductor is not to be required to leave his car to enter a waiting room to announce the destination.

Agreements regarding rates of pay rarely extend beyond three years, owing to the possibility that serious changes in conditions might arise very dissatisfying to the men or the company. If the men are dissatisfied they can leave; but the company, if dissatisfied, must stick it out unless it can manage to secure a reduction by arbitration, as was actually accomplished by the British Columbia Electric Railway in 1916.

Arbitration.—The common way of settling serious differences of opinion between a railway company and its employees is by arbitration. The usual course is for each side to select one arbitrator, often a company officer and a union official, and for these to choose a third. The decision reached by such a board, however, has often been far from satisfactory. One reason for this is that the effort of the arbitrators has been directed, perhaps naturally, toward effecting a settlement rather than toward rendering a decision upon the merits of the case; that is to say, it either exactly "splits the difference" between the rate proposed by either side or it declares in favor of some intermediate scale between the two scales presented to it for consideration. As shrewd bargainers, the union realizes this tendency and nearly always asks for more than it expects to get.

Where the arbitration board is made up as described above, the final decision, of course, rests almost entirely with the neutral or impartial arbitrator as the other two naturally are not likely to change their minds readily. Hence, the choice of the third arbitrator is the crucial point in the selection of an arbitration board. Where the interests involved are large, the position is one of great responsibility, often too great for one man to fill properly, especially when he is in public life and has political ambitions.

The most obvious improvement over the board of arbitration as commonly composed is to increase the number of "impartial arbitrators" from one to two or three. Several men, under such circumstances, would not only be of assistance to each other in arriving at a proper decision but would be of help in justifying the decision after it was announced. Such a change, also, would be in line with the practice in the appointment of public boards with discretionary and judicial powers such as public service commissions, where there are always three and usually five members. This is also the case with the higher courts and the federal commissions. The suggestion has also been made that for the same reason a change from one to two in the number of representatives on each side would be desirable. The reason for this is that a single

representative has necessarily to be largely a partisan. To be otherwise would seem to be neglectful to the interests of those whom he represented. But with two arbitrators representing a side, it is argued, one would give moral support to the other in reaching a decision based on the merits of the case, even if it did not give all that was sought by those by whom he was appointed. Provision for such a plan is made in the 1916 employees' agreement of the South Covington & Cincinnati Street Railway.

In the Indianapolis arbitration of 1913, the arbitrator was the Public Service Commission. One advantage of such a plan is that the public service commission also has control over rates, and if it felt, in any case, that wages should be increased, it could raise the rates proportionately, if such action was necessary to enable the company to maintain a fair rate of return on its investment. On the other hand, if the selection of a public service commission regularly as an arbitrator in wage disputes would mean that the commission would get into labor politics, the result would be unfortunate.

Industrial Disputes' Investigation Act of Canada.—This law, passed Mar. 22, 1907, provides simply for an investigation by an arbitration board of industrial disputes in the cases of mining and public service corporations and is made at the request of either party, or it may be instituted at the request of a certain number of outside persons. Other industries can take advantage of this act if both sides agree. Acceptance of the findings of the board is not compulsory, but during the hearing and until the decision is rendered the inauguration of a lock-out or strike is punishable by fines of from \$100 to \$1000 a day for the employer, or from \$10 to \$50 a day for the employee, and of from \$50 to \$1000 a day for any strike organizer or lock-out inciter. The board is made up of three persons, one recommended by each of the parties to the dispute and a third recommended by the minister of labor, if those appointed by the contestants cannot agree upon a third arbitrator. The Minister of Labor is also authorized to fill the board if either of the parties to the dispute fails to appoint a representative. The law has been in extended use in Canada in settling public utility disputes but has not always been successful in preventing strikes.

CHAPTER XVII

WELFARE WORK

The rapid increase during the last five years in the extent and variety of the employees' welfare work conducted by American electric railways is due at bottom to the desire to attract and keep a high grade of men. But like other employers who are imbued with that spirit of the times known as the "social conscience," the progressive traction corporation realizes that its duty to society also demands that its relation to the men must not stop at daily discipline and the pay envelope. Such a corporation will want to satisfy itself that all of its employees and their dependents are getting the chance to make the most out of their lives to the end that poverty and crime shall be abolished. Welfare work, when properly understood and conducted, does not convey the thought of paternalism. Instead, it is a proof of a desire on the part of the company to establish with its employees that spirit of mutual sympathy and mutual helpfulness which is the essence of success in all co-operative undertakings.

In the following paragraphs an outline will be given of what American electric railways are doing on their own initiative. No attempt will be made to show all the things that are done by any one company, but simply the kinds of welfare work done by a large number of companies. However, a division of welfare practices will be made as follows: Those in which the comfort of the employee is the main point; those where a saving in money to the employee is the main point.

Car Comfort.—The welfare of the worker should begin at the car. For years car platforms were open and both the conductor and motorman were unprotected in all kinds of wind and weather. The comfort now given to the motorman has certainly been found to outweigh the possible danger of fogged or frosted windows, while conductors are protected almost everywhere through the changes due to the inclosed prepayment car. The history of vestibuled car development should serve as a warning to those who to-day oppose the use of stools. A rigid stool is often in the way, but there should be no objection to one that can be folded alongside the dash when not in use. To stand all day is not very agreeable, especially for heavy men. The point has been raised that stools impede the operation of hand brakes, but the average motorman may be trusted to rise if he finds it hard to brake while sitting.

In 1912 the New Orleans Railway & Light Company furnished its

conductors with folding stools for use within certain parts of the residential districts. Some companies place the zone chair restrictions on the timetable.

A number of companies have built complete cabs, either of fixed or folding type, for the motormen. On a few types of single-end prepayment cars a cab is also furnished for the conductor. In several of these examples the cabs also have space for a few of a man's belongings. Generally speaking, however, special cabs are needless, if not impracticable. An electric heater in each vestibule, however, will be appreciated.

In concluding this little discussion on car comfort, too much credit cannot be given prepayment car development for making life easier for the platform man. The motorman now is usually railed off from all



FIG. 118.—Operating depot, Cleveland Railway.

jostling and he effects all door operation without leaving his position. Only seated passengers, if any, are allowed to stay on the platform. Again the conductor no longer has to fight his way through a crowded car, he is always under cover and his fare registration and signaling equipment has been made much easier to handle. Air-operated door and step control and motor-operated fare boxes are among the more recent devices which are making the platform man's life a happier one.

Comfort at the Carhouse.—No carhouse is built nowadays without some comfortable rooms for the men. The modern operator knows that one way to keep his men out of the saloon with its opportunities for discussion of grievances and promotion of drunkenness is to house the "boys" comfortably during their lay-overs or waits for trippers.

The carhouse, therefore, contains at least one room, preferably next

to the office of the station master and not the same as used for making out reports. This room has comfortable chairs and benches, tables for



FIG. 119.—Schedule room with metal furniture in Carmen's Depot, Cleveland.



FIG. 120.—Billiard room in Carmen's Depot, Cleveland.

games, writing materials, files of magazines and newspapers and possibly a branch of a public library, as at Milwaukee. Sanitary lockers, shower baths, gymnasium, pool and billiard tables and a bowling alley are also

desirable. Restaurants, barber shops, clothes-pressing clubs, etc., may also be included. On many properties a slight charge is made for pool, billiards and bowling simply to pay for maintenance, pin boys, etc.

These rooms are usually in charge of a former platform man or retired transportation officer who knows the ways of the men in his care better than those who have not been through the railway mill.

On some properties the carhouse quarters are supplemented by a special clubhouse installed for the employees benefit association at the central dispatching point. In the smaller towns the ground floor of such buildings serves for a waiting room and, where the company does a lighting business, as a store for electrical fixtures. Views of one of the operating depots of the Cleveland Railway with rooms for the men are shown in Figs. 118, 119 and 120.

On foreign electric railways it is customary to furnish living rooms in or near the carhouse for such men as dispatchers, starters, district superintendents and other employees who may be wanted almost any hour of the day in emergencies. In this country the plan has lately been adopted for substation men and might well be applied, in a limited way, to the transportation department.

The Charleston (S. C.) Company was one of the first American railways to provide dormitories for its men at modest prices. These are usually occupied by the extras on ending their late runs at a carhouse in the suburbs. Many of the younger men in large cities have no local home ties. As they get the hardest runs (some with only a short lay-over for sleep), most of them would appreciate a plan that gives them more rest for their bodies and more relief to their pockets.

Social Relations.—The establishment of a cordial understanding with the rank and file is not an easy task in an organization where strict discipline is so vital to good service. Facts secured from a number of experienced operators tend to prove that if the immediate supervisory officers, like station masters and division superintendents, are too intimate with their men in a social way discipline will suffer. The point is that while the supervisory officer must be just, he cannot afford to enter into any relations that will expose any weaknesses in his character. He can have a cordial greeting for his men without making it a point to be in their company every day. The proper time to eat and drink with them is on the occasion of holiday dinners, get-together meetings and other company occasions rather than at the lunch counter of a saloon or restaurant.

Aside from the point raised in the foregoing paragraph, more cordial relations with the men are certainly fostered by bringing them together for other than strictly business matters. On the smaller properties the manager himself can be the "Little Father" of the road in promoting good feeling. Thus one manager gives an annual reception and lawn party at

his home every year. Many others, either in their own names or in that of the company, arrange picnics in the summer and amateur theatrical entertainments in the winter. More lately the moving picture has been added to the entertainments given in the local clubroom or the instruction room at the carhouse.

From the large number of men employed on the big properties it is often found possible to bring out all kinds of talent for entertainments and athletic games. Such companies as Milwaukee, the Brooklyn Rapid Transit and Interborough Rapid Transit have their own military bands, and the last two companies named also have baseball leagues, the championship nines of which compete with the best nine of the neighboring Public Service Railway. These and other companies give entertainments with actors from their working staff and scenery from the shops. Sometimes, as in New York, arrangements are made to secure for the employees and their families half-rate tickets to stated performances at a popular playhouse like the Hippodrome.

The Christmas holidays offer a most appropriate occasion for the expression of cordial feelings by the management. The executive officers write personal greetings to the men and these are sometimes backed by a gold piece, a Christmas turkey or dinner hamper for married men, a box of cigars or gloves for the bachelors, and the like. On the New York Railways and Interborough Rapid Transit Company, \$5 for each man earning less than \$115 a month means about \$70,000. Perhaps the most appreciated feature of the Christmas practices are the parties for children. Thus for Christmas, 1913, the Washington Railway & Electric Company gave an entertainment to 2000 children of its employees. A theater was engaged for the occasion, and dolls for the girls, skates for the boys and games for both were distributed amid much merry-making. Even a baby contest was staged. On Christmas, 1912, the Chicago, Ottawa & Peoria Railway gave each man a bank pass book for \$2 and the banks agreed to add 50 cts. for all accounts left on deposit one year to foster thrift.

The larger the property the harder it is, of course, to establish a spirit of kinship and mutual interest, not only between the men and the management, but between the men in different divisions. A brief review of what is done on the Public Service Railway operating over three-quarters of New Jersey should, therefore, be of some value to those who face the handicap due to size.

First of all each division has teams for various indoor and outdoor sports, as for bowling and baseball, so that large numbers of men on each division are constantly being brought together under most enjoyable conditions. Valuable prizes and trophies are given by the company or its officers and the competitions for these excite much interest.

Secondly, this practice is reinforced by the formation of women's auxiliaries which do much to give the entertainments, and especially the Christmas festivals, a more homelike air than could be attained by Mere Man.

Thirdly, the company broadens the viewpoint of its men by taking them over other parts of the system where they can see different conditions and become acquainted with their fellow-workers.

Fourthly, smokers are given by the company at frequent intervals. The general superintendent of transportation, his assistant or other superior officer of the company makes it a point to attend these meetings not to talk discipline but to discuss operating questions in a broad, friendly and impersonal way.

But perhaps the most pleasing feature is the practice of giving farewell dinners in honor of men who have been retired to a well-deserved pension. These dinners are gotten up by the men of their own accord, the ranking officers of the division and company being guests like the man of the hour. Few gatherings could be more effective than these where men who perhaps have never left the car platform since they began the service for more than a day or a few days at a time leave the company with the happy feeling that their meed of good service did not lack appreciation.

Magazines.—Weekly or monthly magazines for employees are necessary means to cement the human parts of a large system and they can be of much value even on the small property. The way to make a magazine of this kind successful is to encourage the publication of personal and general social items, to quote letters from passengers in praise of certain men, to present popularly phrased articles about the scope and special problems of each department, to publish and explain new rules and special orders and finally to incite emulation by advertising the meritorious records of individuals or divisions in such matters as accidents, register accuracy, coasting and the like. Occasionally such magazines publish technical descriptions, but these naturally appeal only to a very small proportion of the readers. A liberal sprinkling of funny stories relating to electric railways is a good sweetener.

The cost of such magazines need not be a burden. Volunteer correspondents, usually the division clerks, will be glad to transmit the personal and social items, but a little more persuasion may be necessary to get the longer semi-technical articles. The only editorial expense should be that of paying a local newspaper man, if the company is not big enough to have a publicity agent, for a few days' work in making up the paper.

Some of the magazines are printed on coated paper, but the cheaper newsprint paper will serve. If advertising is solicited to help defray

expenses at all only local merchants who will get a *quid pro quo* should be canvassed. The average railway man is a good customer for merchandise, but he does not buy generators, cars, rails or other railway equipment. "Complimentary" advertising of such articles is not in accordance with sound ethics.

At this writing there are probably not more than thirty employees' magazines of the general nature indicated. Quite a number of companies, however, print a weekly or monthly bulletin of pocket size which the management uses to convey some new rule and the reason therefor, to make some helpful suggestion about Christmas or Fourth of July traffic, to suggest watchfulness at the proper season against skidding over leaf-covered or icy rails, to explain how careful operation saves line and track, etc. Publications of this kind do not come strictly under the head of welfare relations, but they do their share to encourage good feeling if couched in language that encourages co-operation.

Money-saving Forms of Welfare Work.—The welfare work that involves the matter of saving money for the employee falls into several classes as follows: Savings in buying meals, tailoring and general supplies; lower rent or home buying; loans; sick and death benefit funds; pensions and insurance. A brief survey of each class follows:

Railway Restaurants.—The carhouse restaurant is probably the most widely accepted form of financial welfare work. The earlier carhouses were not designed to embody restaurant facilities but many of the later ones are. It is neither advisable nor necessary for the management to run the eating room itself. The best policy is to furnish the room, heat, light and equipment free for operation under an experienced chef who may be engaged either on a salary or profit basis. In either event the restaurant should be able to furnish food and drink at a big saving to the men. To prevent stealing, poor food and bad service by a dishonest chef and indifferent waiters, the operations of the restaurant should be subject to a committee appointed by the railway manager and at least part of the committee should comprise men who use the restaurants regularly. A good restaurant saves time and money for the men and keeps them away from the saloon with the blandishments of a free (?) lunch counter. Occasionally the restaurants are run slightly above cost, and then the profits go to the employees' benefit association, as at New York and Milwaukee. The Portland (Ore.) Railway, Light & Power Company gives coffee, cream and sugar free to all men who bring home-lunch to the local welfare quarters.

Laundry, Shoeblack, Barber and Tailoring Service.—Akin to the restaurant question is that of reduced rate laundry, shoeblack and barber service. A daily collar at 2 cts., a shine at 5 cts., and a shave at 10 or 15 cts. cut quite a gash in the daily platform wage. As a rule only the

self-shiners and self-shavers maintain the spruce appearance that should mark the platform man. The cost of keeping blue uniforms clean and well creased in the hard partly outdoor service is also to be considered. Therefore, if the railways want their men to attain that cleanliness so close to godliness they should help to the best of their power. This may be done by establishing low-rate shaving and shoe-shining shops at the carhouses, and even clothes-pressing clubs, as at Atlanta. Since the concessionaires get rent, light and heat free and are sure of a definite amount of business, they are able to do work at one-third to one-half of the usual rates. If the carhouses have no room for undertakings like these, the management may be able to make contracts with nearby tradesmen, either to grant reduced rates at all hours or just for the less busy hours which are often the very ones best spared by the platform men.

Co-operating Buying.—So far as is known the trainmen (about 150) at one carhouse of the Kansas City Railways established in September, 1914, the first (and only) plan of co-operative buying by electric railway men in this country. In general, although prices for food and other necessities are now higher than ever, less than half a dozen electric railways have tried to secure for their men the advantages of concentrated buying. Perhaps, their backwardness was due partly to the fear of assuming extra burdens but it is more likely that managers feared to get in the same bad odor as some mining operators and their company stores. There is no parallel, however, between the two cases. A mining company usually begins its operations in a wilderness where it must perforce build houses and supply food, drink and clothing for the first year or two anyway. Furthermore, the goods are sold on credit so that each buyer is known. Such conditions are fruitful ground for the growth of extortionate prices and compulsory trading.

Absolutely different conditions obtain with the company stores of an electric railway. They are established in places where plenty of stores already exist, the names of the customers are not kept because business is done on a cash basis and as many of the brands are absolutely standard comparisons with regular stores are always possible.

Two distinct plans may be followed in the co-operative buying project: One is for the company to operate its own stores; the other is to secure definite discounts from the merchants who are given all the business in any one district or in any given field. The first plan, as practised by the New York Railways and Interborough Rapid Transit Company saves more for the men under good management but necessarily it is limited in scope since the company cannot engage in every line of business. The second plan, as practised by the Philadelphia Rapid Transit Company is far less irksome to the railway and saves money for the men on

practically all their purchases. Both plans have the common merit of encouraging the men to buy on a cash basis instead of using the easy credit systems that prove anything but easy in the long run.

The New York meat and grocery stores were opened at three carhouses about the middle of 1913. After a few months operation the sale of toilet articles and candy was added at the request of the employees. Employees who live at a distance are encouraged to use the stores as the house-keeping member of the family of each employee has a free pass which she can use to travel to and from the stores. No record is kept of the buyers but each must show a card to prove that she or he represents an employee.

The stores are conducted by a professional merchant along the lines of real live salesmanship. Thus seasonable specials such as turkey at Thanksgiving Day, special gift boxes at Christmas, etc., are featured, besides the announcement of weekly bargains by circulars and bulletins in the carhouses. One uneconomical feature was the peak-load buying on Friday and Saturday, which tendency concentrated sales on or just after pay day. This required extra forces, but at the suggestion of the men themselves arrangements were made later to get extra salesmen by temporarily withdrawing men from other departments.

In December, 1914, the company inaugurated a delivery service, 5 cts. being charged for purchases up to \$2 and 10 cts. for purchases more than \$2, but this plan was abandoned later.

The plan of the Philadelphia Rapid Transit Company is similar to that of the Grosse Berliner Strassenbahn in that discounts for the men are secured from a selected list of merchants. The Philadelphia Company, however, goes further than this by issuing reduced-rate ticket books which are also an identification. A book containing \$10 face and actual value of tickets is sold for \$9.20, a \$5 book for \$4.60 and a \$2.50 for \$2.30—a saving of 8 per cent. Under this plan a ticket-holder can go to any of the stores on the list, numbering some of the finest in Philadelphia, pick out any article, inquire its price and then pay in tickets instead of cash. When the merchant turns in the tickets to the railway at the end of the week he is paid 92 per cent. of their face value.

Co-operative buying, it will be seen, has hardly begun on American electric railways but the methods described show that one very effective way of increasing wages is by enlarging the buying value of the dollars the men are already getting. Individual buying on credit as against joint buying for cash is an economic crime.

Loans.—The question of cash rather than credit buying naturally brings to mind that of making loans to the man in undeserved distress. The grocer or butcher who does business on a credit basis often bears with a delinquent customer for weeks and months. Knowing this, a

good many men will hesitate to break with the credit tradesmen unless they have a little money ahead. It is, therefore, well to be able to assure them that if sickness or other unusual expense arises in their families, they need not suffer the humiliation of stretching their credit, seeking money at extortionate rates or betraying their plight to acquaintances.

A number of companies, appreciating the conditions, now extend loans to their men under easy conditions of repayment at little or no interest. Thus the Milwaukee loan fund established January, 1912, lends \$10 to \$100 without interest and repayments are made at the rate of not less than 10 per cent. per month after an agreed interval following the borrowing. The New York Railways and Interborough Rapid Transit Company also charge no interest. Applications for loans not to exceed \$50 may be made by the employees to the superintendent of the relief department. The applicant must secure from the head of his department an official application blank, which, when properly filled out, must be approved by the head of the department. After the loan is granted, a weekly deduction of 10 per cent., commencing with the week following, is made from the wage, provided the amount payable to the employee after the deduction of all charges does not fall below \$8. In such cases deductions of less than 10 per cent. may be made. Provision is also made for a temporary extension of the time of payment in extreme or exceptional cases. The United Railroads of San Francisco charges 5 per cent. on loans.

In general, loans to the men have been handled with such tact that the men enjoy a great benefit particularly in being freed from the worries and temptations that follow dealings with the loan shark.

Some employees benefit associations also loan money to their members. Thus on Nov. 1, 1911, the Brotherhood of Electric Railway Employees of the Portland (Ore.) Railway, Light & Power Company established a loan fund subject to the following rules: To become a borrower the Brotherhood member must have worked for the company continuously for three months. No loan is made in excess of two weeks' wages. A man employed for less than three months may receive \$5 to enable him to make the deposit required by the company, but he must deposit as security with the Brotherhood the receipt given him therefor by the company. Further loans may be made to such a member during the first three months of his employment in an amount not exceeding one-half of his wages due. Loans are to be repaid in full within two months. Partial payment must be made on receiving each pay check. If the borrower is unable to pay the unpaid balance when the note is due, the time of payment may be extended one month at the discretion of the secretary, but no second extension is granted without the authority of the trustees.

Homes for the Men.—The Grosse Berliner Strassenbahn and other European tramways have built a limited number of model houses which are let at a rental no higher than is necessary to cover interest on the investment and running expenses. As vacancies occur they are competed for by a sort of raffle. No American electric railway has entered house-building or renting, but late in 1914 the employees of the United Railroads of San Francisco organized the Co-operative Home Builders' Association. The officers serve without pay, the only share of the United Railroads in the venture being its moral support and free legal services.

The United Railways of St. Louis has a savings and loan association. The first house was built in 1915 according to plans and specifications prepared in the building department of the railway.

If the men, as at San Francisco and St. Louis, are of a frugal, home-building turn the management may well give them every encouragement, for the man with a house of his own has literally planted himself in the community. On the other hand, there is little need to follow the European plan of home-building. The latter is largely due to the very congested population and consequently high rents in the larger cities. Most American towns, on the other hand, have plenty of room for building because of the straight-fare system. A railway borrowing money at current rates and hiring outsiders to run the houses would have to charge much the same rent as the private landlord who pays 1 or 2 per cent. more for his money but watches the expenses with a personal eye. Furthermore, the liberal riding privileges which are granted on so many systems give the employee a wide choice in selecting a neighborhood for living instead of sticking close to the carhouse.

Sick and Death Benefit Associations.¹—The employees' sick and death benefit association is the oldest and still most prevalent form of welfare work. In some ways its scope has been narrowed as by the workmen's compensation acts (so that an injured man would not be paid twice); in other ways it has been broadened by using its organization to carry on the management of employees' clubrooms and social events; also by adding the feature of pensions, medical inspection bureau, etc. In fact, the sick and death benefit association often serves as the nucleus of all other welfare work except on a few of the large systems, as on the New York Railways where all welfare activities are co-ordinated under a welfare director or as on the Milwaukee Electric Railway & Light Company which has a welfare secretary.

As such the sick and death benefit association is the only welfare proj-

¹ An extended discussion of life, health and accident insurance as applied to electric railway conditions is contained in the report of the subcommittee on social relations, presented at the 1916 convention of the American Electric Railway Association. A similar study of old-age pensions and employees' thrift was presented by the committee on social relations at the 1917 mid-year meeting of the same association.

ect which is supported chiefly by the men themselves. In practically all cases, however, the railway supplements the funds so that it can make good its payments. Sometimes, as at Milwaukee, the company pays 50 cts. to dollar for dollar, but it is more common to guarantee the fund against any deficits which may remain despite the income from dues, from interest on funds, from operation of carhouse restaurants and from picnics, dances and other entertainments. As an example, the income of the Montreal Tramways Benefit Association is supplemented by company donations of \$1 for each \$1 initiation fee, 50 per cent. of the monthly dues and \$4000 at Christmas, while the popular annual picnic adds about \$9000 for an association numbering about 3200 members.

Since employees and employers maintain the association jointly, they usually manage it jointly. In practically all cases the secretarial and financial heads of the railway take care of the association's clerical and money matters, but the executive power is vested in a board of trustees. This board is composed of representatives elected from each class of employees, with the platform men most numerous, and of railway officers appointed by the railway company—in either event he is an employee of long standing. The employees' trustees and the presiding officers are elected annually and their meetings are usually held monthly. Open meetings for all members may be held quarterly or even but once a year. Much of the routine business is delegated to a committee on claims. On the whole, the railways prefer to have these associations self-governing as such organizations develop the talent of the men. The fiduciary and other officers of the company serve without pay.

Membership in these associations is open to all employees in good health and between say eighteen and fifty years of age. The health of the applicant is tested by the employment or association doctor. The initiation fee is nominal. It is rarely more than \$1 and more often less. The dues are either 25 or 50 cts. a month, with possible assessments at each death on small railways or a limiting assessment of \$2 in any one year as in the Third Avenue Benefit Association or \$3 as in the Brooklyn Rapid Transit Benefit association. Generally sick benefit payments of \$1 to \$1.50 a day are made after, say, the third day of report for illness. As this is usually done to avoid fake claims the rule may be abolished where a doctor visits the claimant at once, yet one company with such a system does not pay until eight days have been lost. The number of paid-sick days is limited to a maximum of 100 in any one year. The death payment by the association alone varies from \$75 to \$250 cash and sometimes the association pays the funeral expenses. At Montreal the funeral expense payment is \$50 besides a \$500 death payment. The Virginia Railway & Power Company duplicates out of its own funds its Relief Association's death payment of \$250. In Philadelphia the asso-

ciation death payment is \$150 while that from the 22 per cent. wage fund is \$500 for two-year men.

The Public Service Railway, which carries health, life, old age and accident insurance at its own expense pays sick benefits of \$1 a day up to \$90 in one year and beginning with the eighth day. The death payment is \$300. The Binghamton (N. Y.) Railway pays widows 25 per cent. of the husbands' annual wage if he had been in service one year and 50 per cent. if in service two years or more.

Most associations have but one grade of members, but some have two or three classes. Thus the Rockford & Interurban Railway, Rockford, Ill., has one class which pays \$1 and another which pays 50 cts. a month, the benefits varying correspondingly. The Denver Tramways Mutual Aid Association has three classes of members paying respectively \$1, 75 cts. and 50 cts. a month according to earnings; the corresponding sick and accident indemnities are \$6, \$4.50 and \$3 a week, and the corresponding death benefits, \$1000, \$750 and \$500. The company pays \$25 to every \$100 from the men.

On the Waterloo, Cedar Falls & Northern Railway, the affairs of the Cedar Valley Road Relief Association are administered by five directors, three elected from the trainmen, the other two being the general manager and the superintendent. One feature of the by-laws is that when a member is quarantined, whether the result of his illness, one of his household or a person at his rooming place, the directors treat the case as a sick claim. All sick benefits are \$9 per week for a period not to exceed thirty-six weeks. This sick benefit is unusually high. The death benefit is \$100.

The Newport News & Hampton Railway, Gas & Electric Company has a body organized in 1900 known as the Tidewater Relief Association. This body has always been managed directly by the men. The dues are sufficient to cover the relief work of the association, while the \$500 to \$600 donated annually by the company pays for four or five entertainments a year. These affairs take the form of oyster roasts and dances which are prolonged into the night to give every employee a chance to join in the merrymaking. Among the chief clauses in its constitution and by-laws may be mentioned the following:

Membership ceases with resignation from the company's service; and the withdrawing member is entitled to receive the full amount of his contributions, less the *pro rata* share of disbursements made during his period of membership. A member who resigns from the association but not from the service does not participate in this privilege. The contrary was the case until it was discovered that some men resigned as members, got their *pro rata* and then rejoined a few months later! Under the present rules benefits do not begin until after four months' membership.

The death payment to the heir of a departed member is \$100, but if a member's wife or mother dies he receives \$50 to cover funeral charges and the like. The chief restrictions on the latter unusual provision are that no such benefit shall be paid twice to the same family within two years and that the relative so insured had been passed as in good health when the member himself was accepted.

Members who are not in receipt of regular salary while ill receive \$7 a week while totally incapacitated, \$1 per working day up to the end of the first six months and half that rate during the next six months, but not exceeding a total of \$200.

Sick payments begin for all non-salaried members from the beginning of the eighth day, assuming proper certification by the physician or presentation of other satisfactory evidence.

The management is vested in eight men, four of whom are carmen, two from the mechanical department and two from some other department. This board of managers is elected annually. The managers receive no salary but are reimbursed for any time that they lose because of attendance at association meetings. The only official of the company regularly connected with the association is the auditor, who is custodian of the cash and securities. If awards are disputed they are open to arbitration by a board, the third member of which must be approved by the parties at issue. Dues are deducted from the member's earnings in advance.

Free medical attention is obtainable from any of four physicians, and to prevent malingering a man who reports sick is subject to visitation by fellow-members.

The initiation fee is \$1 and the monthly payment is also \$1. This is more than customary elsewhere, but it should be considered that this association is really self-sustaining and that its disbursements include the unusual feature of death payments for wife or mother, as already noted. Assessments are limited to 25 cts. a month.

This company also has a pension system.

The clerical employees enjoy at half rates all privileges at the Newport News and Hampton branches of the Y. M. C. A., the company paying the other half. In this way the inside workers are encouraged to use as much of their spare time as possible for healthful exercise.

Membership in the mutual benefit association of the Lehigh Valley Transit Company is limited to employees who are over eighteen years and under fifty years of age and have been in the service for at least three months. Membership ceases when the member leaves the employ of the company, but sick benefit payments continue under certain conditions if the resigning member is suffering from sickness incurred while in the company's employ. Employees who are dishonorably discharged

immediately forfeit all association benefits. An applicant for membership must be approved by an authorized medical examiner of the association and endorsed by the superintendent or head of his department. The ordinary initiation fee is \$1 plus 50 cts. for the dues of the first month and a fee to the examining physician.

The regular dues are 50 cts. a month. Special assessments must not exceed 50 cts. in any one month or \$3 in any one year. Members are not required to pay dues while receiving benefit payments. In case the net balance at the time of the annual meetings is over \$500, any excess will be divided *pro rata* among the members in good standing. Sick or injured members are entitled to receive \$1 for each day after the first seven days and for each period not exceeding ninety days in any one year. No payment is made on account of disability lasting less than seven consecutive days. On the death of a member the heirs receive \$150.

In applying for a sick benefit, the applicant's statement must be endorsed by the head of the department. If not endorsed, the latter must write his reasons on the form and transmit the report to the secretary of the association. The secretary then details the physician to examine the member in question. Payment is made only if the doctor's report is favorable. The physician also keeps the secretary advised of the progress made by sick members. Sick benefits are paid weekly and death benefits are paid within thirty days after proof of death is filed with the secretary. Advances may be made by direction of the president of the association for funeral or other urgent expenses incidental the death of a member up to and including \$60. These advances must not exceed the sum mentioned if they are made without the written consent of the person to whom the death benefit is payable.

The president (or general manager) of the Lehigh Valley Transit Company is the president of the association. The vice-president is elected at the annual meeting by a majority vote of the members present. The treasurer of the Lehigh Valley Transit Company is always the treasurer of the association. The secretary is appointed by the board of trustees. The management of the association is vested in a board of trustees, which consists of a chairman and six members. The president is also the chairman of the board of trustees. The president of the Lehigh Valley Transit Company appoints three members of the board, one of whom is the company's treasurer, one the company's vice-president and one a representative of either the railway or the lighting department. The other two trustees are elected by a majority vote of the members present at the annual meeting. The term of office of the trustees is one year and they meet at least once a month.

The plan of the Twin City Rapid Transit Company's mutual benefit association provides for disability, sickness and death benefits, as well

as free medical services at the stations. Membership in the association is divided into three classes as follows:

Class A.—Employees whose monthly wage is \$100 and not more than \$208.33; monthly dues, 90 cts.

Class B.—Employees whose monthly wage is \$60 and less than \$100; monthly dues, 60 cts.

Class C.—Employees whose monthly wage is less than \$60; monthly dues, 30 cts.

The company paid the entrance fee of every employee who joined the association during the first three months of its organization, beginning Jan. 1, 1915.

The company pays into the association for its use and benefit monthly an amount equal to 50 per cent. of the monthly dues of the members. In addition the company pays the entire cost of administration expenses of the medical staff. The company also continues to furnish clubrooms to employees, as in the past. The association pays accident or sick benefits as follows: Class A members, \$12.25 per week for fifty-two weeks; Class B members, \$10.50 per week for fifty-two weeks; Class C members, \$7 per week for fifty-two weeks. The death benefits are: Class A members, \$600; Class B members, \$500; Class C members, \$300.

General Discussion of Association Questions.—Without taking the space to quote the detail dues and disbursements on other properties, a study of these benefit associations in general shows that the men receive much more than they pay in, the differences being made up in the various ways noted.

While some of the younger, floating element on the larger city properties regard the sick and death benefit association as needless, it is generally found that from 50 per cent. to 90 per cent. of all the men belong to it. No one is under compulsion to join, although once in a while an ambitious division superintendent, to ingratiate himself with his superiors, may urge membership a little too strongly. The Third Avenue Railway when it started a benefit association in 1908 was so convinced of its value to both the men and itself that it agreed to pay 50 per cent. as much as the men if 50 per cent. of their numbers joined, 75 per cent. if 75 per cent. joined and 100 per cent. if more than 75 per cent. joined. The offer greatly helped recruiting and the 100 per cent. basis went into effect.

Puzzling features about the benefit association are the status of a member who leaves the employ of the company and his right to a return of any dues in excess of his benefits. Several regulations have been found in regard to the first, but few in regard to the second. In the Brooklyn Rapid Transit Benefit Association membership need not cease with resignation if the member has been in the company's employ at least two

years, if he remains a resident of the city (in order to be subject to physical inspection) and if he does not enter the liquor or similar business. The Binghamton Railway Benefit Association several years ago had a by-law which permitted even non-resident ex-employees to remain members. By far the greater number of associations, however, state plainly that only employees can join and remain as members. The last is the only correct policy in view of the fact that the associations are aided by the companies which are under no obligations to do favors for those who have left their service. Again, the supervision of claims becomes a more difficult matter even if the ex-employee stays in town, and it becomes practically impossible if he leaves town.

Are employees who resign both job and membership entitled to a return of any part of what they paid into the benefit association? Probably the most common answer would be: "No, because the employee was a member of a voluntary co-operative body the dues of which were for the protection of his fellow-members as well as for himself. In other words, he did not assume a personal risk but an associated risk. He is not entitled to all that he paid in less the outlays for his benefit; nor is he entitled to a *pro rata* share in any event, because part of the funds came from the company."

Exactly opposite conclusions are contained in a decision rendered in December, 1914, in the Court of Appeals, District of Columbia in the case of Vermillion vs. Philadelphia, Baltimore & Washington Railroad (42 App. D. C. 579). George W. Vermillion had entered the employ of the company on Oct. 1, 1893, and was dismissed from the service Oct. 31, 1913, more than twenty years later. His suit for all dues paid by him into the railroad's benefit association was denied in the District Supreme Court, but he won on appeal. The three strongest points made by Vermillion were that membership in the association was practically compulsory, that he had been dismissed from the service and that the membership had been of no benefit to him.

While this decision does not settle the matter for all times and all circumstances, it does indicate that ex-members may cause trouble if they raise the same point. The Montreal Tramways Benefit Association has the following rule on this point: Men who resign after five years' membership are entitled to one-third of all dues paid in by them less the cash benefits received (no charge being made for medical service and medicines), and if they resign after ten years' service they are entitled to two-thirds of the money that they have paid in.

Generally speaking, as the company pays a considerable proportion of the annual expense of the association, the contribution of each man may properly be considered as defraying only the cost of carrying his risk while a member. Actually, of course, if the company pays half,

the half paid by the men is usually much less than the cost of carrying the annual risk.

By-products of the Benefit Association.—Two valuable by-products developed to a degree from benefit association experience have been introduced by several companies, particularly those at Milwaukee, Brooklyn and Newark.

Since 1912 the Milwaukee Company has a welfare secretary who visits the men to extend help when they are in trouble because of illness or death in the family, to offer free medical attention for his children if need be and to assist in securing aid from municipal welfare institutions whose very existence may be unknown to them. The welfare secretary may go still further and smooth out domestic tangles if tactful inquiry shows that his intercession would be welcome.

The Brooklyn Rapid Transit System's development from sick benefit association work bears the formidable name of "Compulsory Medical Inspection." The system was inaugurated Jan. 1, 1913, and the need for it is answered by the fact that the time lost by the 9000 transportation men alone was 24 per cent. less than in 1912.

The investigation which led to the new system disclosed that men frequently applied for one or two week's sick leave without asking for the examination to which they were entitled as members of the relief association. Many of these men were not sick at all but simply wanted a vacation. One bad consequence was the disorganization of the service, and another the refusal of sick leave to men who needed it.

Further, a study of hospital cases showed that quite a number of men had been obliged to go there through neglecting or misconstruing the symptoms of such common disorders as grippe, pneumonia, lumbago, rheumatism, neuritis, neuralgia and digestive troubles. Now when a man reports sick from his depot or terminal, he receives an excuse card which sends him to the nearest of three examination offices. The doctor examines the employee and either excuses him for more or less time or, if he is feigning illness, orders him to return to his depot where discipline is administered.

If a man is excused indefinitely, he receives treatment at home or at the doctor's office until recovery, when he receives a certificate which states when he can resume work.

If a man reports that he cannot leave his house his depot notifies the Medical Inspection Bureau. Within 6 hr. thereafter a doctor calls at the man's house and follows the procedure outlined. If a man is excused for a limited time and is unable to return to work at the expiration of such time, he is re-examined and receives a new excuse card. While the men are not obliged to accept the attendance of the company's physicians, the latter should know and report whether the patients are getting proper

service. Simple remedies for colds or constipation are dispensed without cost so that a man loses no time in returning to work because of failure to buy medicine. Improved first-aid outfits, electric garment dryers to dry clothing of men who come in wet from a storm and health bulletins on various topics do their share to maintain the health of the men. Even a sanatorium is a possibility of the future.

The compulsory medical inspection plan is in line with the work of such bodies as the Life Extension Institute which co-operates with life insurance companies to give policy-holders free or almost free examinations with the view of prolonging their lives. Where a company already has a benefit association the Brooklyn method might be readily followed with little extra cost and least misunderstanding. The physicians attached to the employment and claim departments could also be assigned to this work.

The Public Service Corporation of New Jersey, of which the Public Service Railway is a part, has made detailed analyses of the illnesses suffered by its men on the basis of occupation. The report for the year ending Dec. 31, 1913, showed that in the case of trainmen the diseases most frequent among them were influenza, rheumatism, bronchitis, quinsy, tonsillitis and stomach troubles—ailments which are due chiefly to exposure and lack of care of the diet. Thus the company is finding out along what lines it can best conserve the health of the men through its own efforts in improving car and carhouse comforts, meal reliefs, etc. Further, it is seeking to educate its men by means of readable bulletins on hygiene, sanitation and the prevention of disease. Its excellent pamphlet on "The Ravages of Venereal Diseases" deserves special praise for discussing frankly and helpfully a subject of which too many people are still ignorant.

Pensions.—One of the most gratifying developments of recent years has been the establishment of old-age pension systems, so far chiefly for non-salaried men. As in other American industries, a few electric railways had given this plan thought but most had dismissed it as too costly. Yet the rapid changes in the rank and file of their employees should have made electric railways leaders instead of laggards in this movement. Now the realization has dawned that the pension plan is worth its cost if it can create a class of men who are proud to enter and stay in the service.

In Germany, where the pension system is in charge of the State, the cost is borne jointly by State, employee and employer. In the United States pension systems are purely private undertakings shared in some cases by the employee, but to which the State contributes nothing. As a rule, employees are very unwilling to contribute to a pension fund if discharge or resignation automatically suspends their rights. Under the State pension system a man retains this privilege regardless of changes

from one employer to another. It follows that an American corporation can inaugurate no pension system that will hold its employees unless it defrays the entire cost itself. At first sight this handicap appears to make pension systems prohibitive in cost, but this is not borne out by the experience of the few companies that have such provisions for the super-annuated or invalid employees.

In the first place the actual number of pensioners is very small in comparison to the total number of employees; second, the men are retired at an advanced age, like sixty years, so that even if they cannot safely follow their original vocation they may still be of use as watchmen, caretakers, switchmen, messengers and the like; third, as pension systems are attractive the railway gets the choice of better men.

Since small railways cannot maintain pension systems for actuarial reasons, they will eventually have to organize a joint pension association or take out pension insurance if they should decide to establish funds of this kind.

The oldest American pension plans like those of Montreal and Denver are part of the benefit association, but those of more recent date are paid for directly by the company.

The Montreal Association pays 50 cts. a day to all retiring employees who have reached the age of sixty-five and served not less than twenty-five years.

The value of the long-continued welfare work on this system is shown by the fact that of 2795 members in 1913, 57.5 per cent. had been with the company from one to ten years and 29 per cent. from eleven to forty-two years.

The Denver Tramways pensions, after at least fifteen years' service, men who wish to retire at sixty-five years and men who are compulsorily retired at seventy years. The men are divided into three classes, according to previous earnings, and the pensions are respectively \$15, \$20 and \$25 a month. The maximum amount is that paid to all uniformed trainmen.

Under the Brooklyn plan, inaugurated Dec. 16, 1909, no employee in the service Jan. 1, 1910, and no employee who entered the service after Jan. 1, 1910, was eligible for retirement and a pension allowance unless he was a member of the Employees Benefit Association within one year after that date, or within one year after he should have become eligible to such membership, nor unless said membership should have been continuous thereafter. However, any employee in the service prior to Jan. 1, 1910, who had attained the age of fifty years, and who was not then a member of the Association, was nevertheless eligible to a pension allowance if he had served the company in all other respects as hereinafter provided.

Leave of absence, suspension, dismissal or resignation followed by

re-appointment within six months is considered a break in the continuity of service.

Any employee seventy years old, whether incapacitated or not, and any employee sixty-five to sixty-nine years (both inclusive) who has become incapacitated; who has made application or has been recommended for retirement, and who has submitted himself to a physical examination by a physician or physicians designated by the Board of Pensions, and shall be thereafter retired by said Board, is entitled to a pension as follows:

(A) If in continuous service for thirty-five years or more, 50 per cent. of the average monthly pay received during the ten years immediately preceding retirement.

(B) If in continuous service for thirty years, and less than thirty-five years, 40 per cent. of the average monthly pay received for the ten years immediately preceding retirement.

(C) If in the service of the system for twenty-five years and less than thirty years, 30 per cent. of the average monthly pay received during the ten years immediately preceding retirement.

Any employee who has not reached the age of sixty-five years, but who has been in the continuous service of the system for at least thirty years, and who has become incapacitated, may be recommended for retirement, and be retired by a vote of the Board of Pensions, upon such examination and conditions as may be imposed by said board and with the amount of pension as fixed by paragraphs A and B.

The minimum monthly pension allowance is \$20.

Pension allowances are paid monthly. No assignment of pension is permitted or recognised.

No employee whose maximum wages have exceeded \$1500 per annum for a period of more than five years is eligible for retirement or consideration under the above regulations.

In 1915 there were eighty-three employees on the pension list, and the amount paid to them averaged \$30,000 a year. The company paid out \$13,000 a year for medical attendance, and it donated \$18,000 a year for welfare work, such as clubhouse expenses, amusements and other incidentals for the benefit of employees. The total annual outlay for welfare work was therefore about \$60,000.

Since January, 1910, the Philadelphia Rapid Transit Company has paid \$20 a month to employees who have reached the age of sixty-five years after twenty-five years' service.

On the Public Service Railway, retirement of sixty-five-year-old men in service twenty-five years or more is optional and of seventy-year-old men compulsory.

The amount of annual pension is calculated as follows: For each year's service, 1 per cent. of the average wage or salary for the ten years preceding retirement, provided, however, that no pension shall be less than \$240 annually. For example: An employee whose average salary for the ten-year period had been \$1200 and whose continuous service had

been thirty years would receive a pension equal to 30 per cent. of \$1200, amounting to \$360 a year or \$30 a month.

Failure to make application for retirement on pension at the time of reaching the age of sixty-five years and completing twenty-five years of continuous service does not deprive any employee of the right to make such claim at any later date during his continuance in the service, nor does retirement on pension deprive any employee of the benefits of the \$300 insurance; but employees retired on pension are not entitled to sick benefits.

The Public Service Corporation has added a fine human touch in its pension work by the publication in the annual reports of the welfare committee of portraits and short biographical sketches of each pensioner.

Under the Milwaukee plan of Jan. 1, 1912, men may retire at the age of sixty and after only fifteen years' service. Compulsory retirement is at the age of seventy. The company pays $1\frac{1}{2}$ per cent. of the average annual wage received during the last ten years multiplied by the years of service, but not less than \$240 nor more than one-half of the annual wages for the decade preceding retirement. No allowances are made for increments in salary exceeding \$1500.

Under the plan of the San Francisco-Oakland Terminal Railways, Jan. 1, 1913, employees retire at seventy except that platform men, train collectors, tower men, dispatchers, etc., may do so at sixty-five—or after twenty years' service if between sixty and seventy; also twenty-five-year men and twenty-year women may retire even if less than 60 years old. The company adds that pensions may go into effect earlier for exceptional service. The allowances are as follows: For each year of service $1\frac{1}{2}$ per cent. of the first \$50 of the highest average monthly pay during any consecutive ten years of service, plus 1 per cent. of any excess over \$50 with a minimum of \$20 and a maximum of \$75.

A still more extended plan, although not embracing salaried men, is that announced Jan. 1, 1914, by the United Railways & Electric Company of Baltimore. The non-salaried men entitled to pensions classify as follows:

(a) Those who are seventy years old; (b) incapacitated men between sixty-five and sixty-nine years of age; (c) incapacitated men below sixty-five years of age but in the company's service at least thirty years; (d) any employee after twenty years of service if physically or mentally disabled in the service of the company.

These four classes are paid respectively 50, 40, 35 and 30 per cent. of their average monthly wage received during the ten years just before retirement. On New Year's day, 1915, each pensioner was presented with a handsome certificate recounting his service to the company, a pass for traveling over the Baltimore system at will and a letter from the management expressing the hope that he would remain a member of the "family" for many years to come.

The United Railways, St. Louis, Mo., announced, effective on Jan. 1, 1915, the following:

Any sixty-year-old employee fifteen years or more in service and incapacitated for work may upon request retire from active service with a pension for life. Any employee seventy years old with the company twenty years continuously may be retired on a life pension unless exempted by special ruling of the general manager. The amount of the annual pension is $1\frac{1}{2}$ per cent. of the average annual wage received during the employee's last ten-year period of service multiplied by the number of years of the employee's continuous service. It is provided, however, that no pension shall be less than \$240 a year or more than 40 per cent. of the average annual wage. The largest salary considered for the purpose of computing the pension allowance is \$1500 a year. All pensions are paid by the company.

While the pension plan is embodied in the employees' mutual benefit association of the Twin City Rapid Transit Company which was organized on Jan. 1, 1915, all pension charges are borne by the company. The point here is that only association members are eligible to pensions. The pension allowance is based on 2 per cent. per year of service of the average annual wage for the last ten years, with a maximum of 50 per cent. Since retirement begins at sixty-five years, practically all pensioners get half pay.

Among other companies with pension systems are the Bangor Railway & Electric Company, Lewiston, Augusta & Waterville Electric Railway and the Portland Railroad (all in 1912), pensions being possible after twenty years or after injury; the Third Avenue Railway, New York, in 1915; the Omaha & Council Bluffs Street Railway in 1915, excluding men earning more than \$125 a month, and the Lehigh Valley Transit Company for employees after twenty-five years of service.

Group Insurance.—The financing of protection embodied in the mutual benefit associations, including pensions, constitutes a local isolated risk in each case. This is not in accord with proper principles of insurance which demand that the risks should be spread over the widest possible territory and among the greatest possible number. Localized insurance cannot take care of epidemics or other causes of unusual loss of life without serious danger to the insuring organization. Therefore, as already noted in speaking of pensions, the time is near when the railways, and particularly the smaller properties, will have to form mutual insurance associations, or else arrange to insure as a unit in one of the standard insurance companies, if they plan to take up any of this work.

Group life insurance, introduced in 1913, is notable, therefore, not only as a supplement to or successor for the death payment of the mutual benefit association, but also for the fact that the railways do not carry this risk themselves.

The premiums are paid either entirely by the company to cover a given bulk insurance or shared on individual policies between employer and

employee. In the former case, the policy made out for a given person lapses with his resignation, but the insurance would be made out for his successor; in the second case, a resigning employee may retain the policy if he is willing to pay the insurance company's full premium rate thereafter. Some policies include health and accident, but provision for the latter is hardly necessary where a workmen's compensation act is in force.

Group insurance probably gives a better return for the money expended than any other form of welfare work. As an example, suppose a company felt that it could not afford to increase its pay-roll 4 per cent. by raising the average platform wage from 25 to 26 cts. an hour. Yet if it could afford to increase the pay-roll by $1\frac{1}{2}$ per cent. or even only 1 per cent., it could insure the men for \$1000 each without any expense to them. If the men share the expense equally, the cost to the railway will be only $\frac{1}{2}$ to $\frac{3}{4}$ per cent. of the pay-roll.

The rates quoted for insurance are very low because the usual expenses of solicitation, examination and collection fall away, and they are wonderfully low when compared with the rates charged for small industrial policies, the only kind that a platform man could afford. The insurance company solicits only what might be called a master policy which may cover ten men to 10,000.

Group insurance need not be limited to the trainmen, for as these form so great a proportion of the employees the addition of a few men with hazardous occupations, like power station and linemen, will not affect the rate. The clerical forces should also have the benefit of group insurance.

The following are some of the companies that early took up group insurance under the conditions summarized:

The Meridian (Miss.) Light & Railway Company insures at its own cost all white employees who have been in service six months or more for an amount equal to one year's wages with a maximum limit of \$3000. This insurance increases automatically with wages. The company also pays \$100 funeral expense regardless of the amount of the policy. The annual cost is \$15 per \$1000, but may be lowered by the insurance company to \$10 per \$1000 in case of dividends due to segregating group insurance transactions in one department. The Southwest Missouri Railroad, Webb City, Mo., after one year from the inauguration of a similar plan in March, 1913, applied the dividends to raise the average policy from \$1000 to \$1200.

The Pittsburgh (Pa.) Railways announced under date of Feb. 9, 1914, that it had secured a blanket policy to insure at its own expense the lives of employees in the service of the departments hereinafter named. Upon death, the family of such employees of two years' service or more receive from the insurance company an amount approximating his previous year's

wages, not as a bulk sum, but in checks payable monthly over a period of one year. If the deceased had served for one and less than two years his family receives approximately one-half his full year's wages, payable as above. This insurance includes not only transportation men but employees in the following departments: maintenance of way, carhouses and shops, overhead lines, substations, monthly employees and general office force from the president down.

The Pittsburgh (Pa.), Harmony, Butler & New Castle Railway insured its men in much the same way as the Meridian, Southwest Missouri and Pittsburgh companies.

On Jan. 1, 1914, the United Railroads, San Francisco, Cal., took out at its own cost group insurance for all employees who had been in the service of the company three years or more. All of those who had been in the service of the company between three and four years were insured for \$250 each; those employed four to five years, \$500 each; five years and over, \$1000 each. The individual is not furnished with a policy, as all the men are insured in the name of the company, but each employee was presented with a card which will entitle his or her beneficiary to receive from \$250 to \$1000, in accordance with the plan.

The Colorado Springs (Col.) & Interurban Railway pays the premiums for \$1000 policies while the men remain in its employ and continues to do so should they be disabled on duty. Some of the 225 men insured were sixty years old, yet the group plan led the insurance company to waive physical examination.

On the Third Avenue Railway, New York, the railway and 2000 of its men divided the expense as follows: The \$250 benefit association policy was exchanged in 1913 for \$1000 life insurance on the basis of \$7 a year payment by the employee and \$4 a year by the company. The company holds back the men's share each week and makes lump payments to the insurance company. Should the men leave the service their policies may be continued in force, but at regular insurance company rates.

A group insurance policy providing \$500 death benefits has been written on the 133 employees of the Kansas City, Clay County & St. Joseph Railway, all of whom were members of the mutual benefit association of the railway. Because of the character of the policy, namely, the inclusion of all the members of a group exceeding 100, the exceedingly low rate of about \$10 per \$1000 was possible.

In September, 1915, the Brooklyn Rapid Transit Company entered into an arrangement with an insurance company to insure the lives of all employees in active service for two years or more. Those eligible numbered more than 8000 and as more than 5000 (5200) accepted at once, medical examination was waived up to Jan. 1, 1916, for men then in the service for two years. Examination in the future is waived if men

completing their second year apply for insurance within six months. The company pays one-half of the annual premium on insurance up to \$1000, and in certain cases pays the entire premium. Any employee, if he chooses, may take insurance up to \$5000, subject to the approval of the insurance company as to his physical condition.

The policy is the so-called "term" insurance, namely, insurance taken for one year but renewable from year to year indefinitely. The rate differs with the age of the employee, and the annual premium, which will be paid in the first place by the Brooklyn Rapid Transit Company, is believed to be the lowest at which such insurance has ever been written. For the employees it means that those under thirty-two years of age will have their lives insured for \$1000 upon the payment of about 7 cts. a week; employees more than thirty-two and less than forty, about 8 cts. a week, and so on. The company assumes the entire premium in the following cases and under the following conditions:

(a) Employees who, after taking out this insurance, may thereafter be retired under pension pursuant to the rules and regulations of the pension bureau.

(b) Employees who, taking out this insurance and having served at least ten years with the company, are obliged by reason of partial disability not due to accident in the service of the company to accept with the company employment materially reducing their earning capacity from what had been their average annual earnings for the ten years last preceding such change of position.

(c) Cases calling for particular consideration.

Employees have the option of discontinuing the insurance after the expiration of any year. Special privileges have been obtained from the insurance company, whereby any employees not remaining in the service of the transit company may, within a limited time after leaving such service, take one of the regular life or endowment policies of the insurance company as of the age at which he entered the insurance group by paying the difference in premiums applicable to the different kinds of policies. The insurance policy contains also provision for total and permanent disability, whereby before death the amount of the policy will be paid in installments.

On June 1, 1915, the Newport News & Hampton Railway Gas & Electric Company put its insurance system into force. Under this insurance plan all colored employees under sixty years of age who have been in the employ of the company continuously for three years, and all employees who complete three years' continuous service, are entitled to life insurance to the amount of \$500. White employees who average a higher wage are insured for \$1000.

In January, 1916, the Union Street Railway, New Bedford, Mass., arranged for the group insurance of 500 employees. The Jamestown Street Railway and associated lines insured their employees in April, 1916, and the United Railways & Electric Co. of Baltimore in July, 1916.

Liability Insurance.—The recent passage of workmen's compensation acts in many States has made it necessary for railways to take out insurance for conditions not covered by benefit association, pension or group insurance plans. There are five plans possible for insurance against this hazard: (1) stock company insurance; (2) mutual company insurance in a company composed entirely of electric railway companies; (3) insurance in a mutual company composed of railway and lighting companies and possibly companies in other industries; (4) insurance in a State fund, and (5) self insurance. Of these plans the last is advisable only for the very large companies, but for them it has manifest advantages, as the catastrophe hazard is almost negligible as compared with that in industrial plants and similar institutions where all the employees work together or in large groups. Of the remaining plans that of insuring in stock companies is directly the most expensive. The rates charged in New York State under the liabilities created by that law were (in June, 1916) for urban operation \$3.24 per \$100 of pay-roll, and for interurban operation \$5.18 per \$100 of pay-roll, with certain deductions for companies which had fulfilled specified requirements as to the appointment of safety committees, safeguarding of hazardous machinery, locations, etc. At the time mentioned the rate charged for insurance in the New York State fund was \$2.50 for urban and \$4.75 for interurban roads, based on \$100 of pay-roll, but up to July 1, 1916, the administration expenses of this fund had been borne by the State. After that date they were to be borne by the fund, and this added expense presumably would increase the cost of this insurance. The most desirable plan seems to be some form of mutual insurance. Such an organization with membership made up of electric railway and lighting companies is being conducted in New York State.

The Savings of Welfare Work.—The subject of welfare work could not be better concluded than by statistics to show that it can pay for itself in a truly amazing way. The example is offered by the Public Service Railway which in the year of 1912 spent \$104,818 for health, accident, old age and life insurance for 13,421 employees. Yet it was more than compensated for this expense by the savings due to the platform employees alone, although the latter numbered but 3654 in all. One great cause for this splendid showing was the fact that the inauguration of the several forms of insurance cut down the resignations of trainmen by 31 per cent. as compared with the preceding year. Furthermore, immediately after the company announced its welfare scheme hundreds of former trainmen who had left the service with excellent records applied for reinstatement, so that the company was not only saved the cost of breaking in hundreds of green men, but secured a very large proportion of experienced operators. The saving in the cost of training new men,

great as it was, was but a trifle compared to the greater saving from the reduction in accidents; and accidents not only cost money, but create much anguish and many enemies.

Extensive welfare work on the Interborough Rapid Transit Company, New York, led to the following comparison: For the fiscal years ending June 30, 1912 and 1914, of employees who left the service: conductors, 1912, 4 per cent.; 1914, 2.9 per cent.; guards, 1912, 17.2 per cent.; 1914, 5.4 per cent.; motormen, 1912, 16 per cent.; 1914, 1.1 per cent.

CHAPTER XVIII

DISCIPLINE OF TRAINMEN

The hours required of railway trainmen are no longer than in many other lines of work from which the railway force is recruited, the wages, as a rule, are at least equally as good, and the chances of being laid off on account of slack business are far less. Nevertheless, it is the experience of most roads that a considerable proportion of the men who have successfully passed the several examinations leave the service. Undoubtedly there are two great reasons for this condition. One is that the semi-military discipline necessary in railway operation is irksome to some men who have never been trained to respect rules. Another reason, applicable to conductors, is that they are exposed to irritating contact with passengers.

As to discipline: Unlike his German fellow-worker, the American who enters electric railway service is not an ex-soldier familiar with the need for, and used to, discipline. It is a new experience for him to enter a quasi-military organization where hundreds of rules must be conned to the letter, in which any disobedience may bring severe punishment and in which there is direct personal legal liability for neglect that leads to accident. It goes without argument that discipline must be maintained to secure safe railroading, but the iron hand wears a velvet glove none too often. Would not more men stay in the service if the direct masters—the inspectors, starters, depot superintendents and division heads—were taught to exercise such plain sense as to reprimand a man in private instead of in public?

But, after all, to make discipline palatable it must be understood. The work must begin at the beginning. In the schoolroom the recruit must be told not only to do things a certain way, but why he must use that way and no other. On too many roads the student still receives a large number of rules to be memorized without the benefit of analysis and explanations by a real teacher.

As to the disciplinary officers: It is an old cry of the platform man that he has too many bosses. The brusqueness and incivility of the petty officer is often a just cause of complaint. The Germans say: "A corporal is a harder master than a colonel," for he delights to show his authority over the class from which he sprang. The management is at fault here if it has promoted from the platform ranks men who have no

other merit than good records and seniority. They must also be natural leaders and of good temper. An inspector, for example, who is unwise enough to bandy words with conductors and motormen while they are at work on the car does not gain the respect of the men and distracts them from their work.

As to irritating intercourse with the public: Job himself was a pampered individual compared with the tribulations of many conductors. Many passengers appear to hold the conductor responsible for any rules which are displeasing to them, arguing with him instead of the management. A most fruitful source of heckling is in regard to transfers. Every railway should keep posted in a conspicuous place a placard pointing out that the conductor has no choice but to obey the rules and that all complaints should be directed to the management. If it is not convenient to post such an announcement, the conductors should be furnished with pocket cards bearing a statement of this kind. The Public Service Railway, Newark, N. J., saved its conductors a great deal of irritation following the inauguration of a no-smoking rule by furnishing them with explanatory cards which could be handed to violators of the rule.

A third cause for discontent with railway service, although it should not affect the right kind of man, lies in the rules which are usually laid down concerning personal habits. Many companies rightly frown upon drinking, whether on or off duty, and prohibit smoking while on platform service. Thus, in April, 1914, the Pittsburgh Railways opposed the renewal of licenses to saloons near its carhouse, and all the saloonkeepers felt obliged to promise the license court judges that they would not sell liquor to the railway men in uniform.

The public position of trainmen also leads to strict rules about reporting for duty with shoes shined, face shaved and a clean collar. Most men out of the courtship era are inclined to be negligent of appearance. Hence, if the railway wants to enforce this rule without needless friction, it should encourage neatness by providing low-rate facilities for personal adornment as noted under Welfare Work. In general, the requirements on this score are reasonable enough, but it is not necessary to go so far as a Canadian road, which forbids its men to wear beards.

Rules and Bulletins.—To discuss the various operating codes of American electric railways would demand a book—and a big book—in itself. Year after year these rules have been considered from every standpoint by the American Electric Railway Association, and since 1909 two codes have been available in booklet form as helpful guides for city and interurban operation respectively. Each year since their adoption revisions have been made to meet changes in the art, so that the latest rules published constitute excellent reviews of the latest American practices. While it is obviously impossible to create one set of rules to meet all city

and interurban conditions respectively, many companies have adopted these codes *in toto* and others have used them as a framework on which to superimpose rules covering special conditions of their own.

In addition to this class of permanent rules are those of a temporary nature relating to special schedules, holidays, etc. Usually these are not issued in convenient pocket form but are posted on mimeograph sheets at the depots where he who runs the cars may read—and remember if he can. Such announcements soon fade, and as every other one is out of date they are not likely to be read by the men with the same eagerness that they display at a baseball scoreboard. If the importance of these bulletins is to be gauged by the way they are printed and displayed, many managers have a poor opinion of their own orders. If posters are used they are legible enough, but because of their size they soon overlap and obscure one another. Apparently somebody is always ordered to put up the announcement, but no one is ever ordered to take it down when it has outlived its usefulness. A Fourth of July caution and a Christmas announcement don't look well side by side. Even in cars, we have seen retained an order about equipment discarded ten years before.

The men would be more likely to read all announcements and feel more responsibility for obeying them if they were furnished with an individual loose-leaf book. In this book they could place the new orders, either printed or mimeographed, and from it they could remove the obsolete orders at their own volition or in exchange for the superseding orders. This book should be uniform in size with the standard rule book, serving as a supplement thereto. Stickers bearing the rules for pasting in the rule book have also been used, but this does not eliminate the obsolete orders so readily, while the loose-leaf book is never out of date. The employee's magazine lends itself well to first announcements, letters from the management, etc., but, of course, men cannot be expected to tear out the pages and carry them in their pockets. If the rule books can be printed with the user's name thereon in gilt letters, so much the better for encouraging a sense of responsibility and ownership.

Systems of Discipline.—The consensus of opinion among American electric railway operators with regard to the disciplining of trainmen is that suspension should be avoided; that dismissals should be countersigned by an official who is not in daily contact with the men and that under no circumstances should a man dismissed for a major offense be re-employed.

According to the 1912 report of the American Electric Railway Transportation & Traffic Association, disciplining by reprimand or by suspension still prevailed on most railways, while a variation of this was to place the man on the extra list. Since this date, however, additional roads have adopted the merit system hereinafter described.

Suspension can hardly be considered as anything but a makeshift for it depends too much on the moods and prejudices of the disciplinary officer, whether these are exerted for or against the offender. It has been pointed out again and again that not the guilty man but his innocent family is hurt most by the loss of pay which follows suspension. Aside from this consideration it has been found that the very ease of drawing a suspension tempts men who have no family responsibilities to break a rule purposely just to get a day off. For the last reason it has been suggested that a man who obviously violates a rule for this purpose should be punished by making him work that day instead of ordering the suspension coveted.

No special system of discipline is required with regard to dismissals. Certain offenses such as drunkenness, stealing, deserting the car in the street and gross negligence in accidents are unpardonable. But final sentence even for these offenses must not be pronounced until the defendant has had the chance to appeal to a disinterested man higher up, be it the superintendent or even the general manager. Where the disciplinary officer knows that his fiat is not final he is bound closer to the laws of evidence than to the voice of passion.

Merit Systems.—As any method of discipline which depends upon the personality of the disciplinarian is open to abuse and favoritism, some companies, including both very large and very small systems, have adopted in various modifications a system of merit and demerit marking. In this system every foreseeable offense receives a number of demerits based on its severity, while every act which furthers the railway's good, particularly in avoiding accidents, is given a certain number of merits. The object of the system is therefore twofold: "To make the punishment fit the crime" independent of the disciplinary officer's whim; to give a man a chance to offset debits by credits.

Under the theory of this system a balance is struck say at yearly intervals. The man who has accumulated a critical number of demerits is discharged; the man on the right side of the ledger may be posted on the divisional Order of Merit list at his carhouse or receive more substantial recognition in an advance of wage classification, premium or share in a portion of the annual surplus. It is obvious that under every merit system there should be some provision by which a man's demerits become cancelled in whole or in part at the ends of certain periods. Otherwise most old and experienced employees would automatically become discharged in time.

This system is clearly an advance over one that can be so easily affected by every petty officer's friendship or enmity. Yet, like all devices that place human relations on a mathematical basis, it must be applied with judgment. Thus, in considering a man's demerits it is

advisable to analyze the causes for them. Herein lies the most indisputable advantage of this system—it gives a complete operating record of each man. It is conceivable that of two men who have the same number of demerits one accumulated them by neglecting his personal appearance while the other accumulated them by testy arguments with passengers. In this case there is certainly more hope for the first than for the second. Again, a comparison of men by groups will show at once what rules require special emphasis—say advice on brake operation when collisions are unusually common.

It is very important also to make allowance for inexperience. Many offenses like failure to give the right number of bells and to register fares separately as collected instead of bunching them are often due to the flurry in which a new man falls during the heavy hours. Even where personal discipline by reprimand or suspension obtains, the superintendent is too likely to be impatient with the shortcomings of the recruit. Several railways, notably the New York State Railways at Rochester and Syracuse, therefore adopted as lately as 1913 the plan of having discipline for minor offenses administered by the platform instructor during the first six months. A motorman-instructor and a traveling conductor-instructor also watch these men to see what weaknesses require correction by further teaching, and without prejudice to the standing of the men.

So far as the writers know only one large company, the Denver Tramways, gave up the public merit system after installing it. This company found that the demerit slips which were sent to the men after each offense created more bad feeling than could be offset by the good-conduct slips. Furthermore, the labor of keeping records was increased by nearly one-half, and so, after two years of effort to promote closer relationship, the company reluctantly abandoned this system as a failure. At the present time its records are kept with the same vigilance as formerly, but the demerit marks are absent. "The company refers to it as "the silent system" and uses its discretion as to making any part of it public, even to the men most concerned. Disciplinary notices are sent out with much less frequency. The company adheres strongly to the principle that a heart to heart talk in the privacy of the superintendent's office does more good than cold-blooded demerit notices, but it is also quick to acknowledge publicly an act of merit. It resorts to suspension rarely, and even this does not mean total absence from duty. It means that an offender who has a regular run must pay his penalty upon the extra list and see an extra man marked up in his stead. To an extra man it implies a position at the foot of the extra list each day until his sentence is served. The results have been very satisfactory.

It will be observed that although the Denver Tramways gave up the merit system as such, actually it retained the record system in principle,

although emphasizing the silent feature and giving warnings and applying discipline to the offender at rarer intervals. The Denver experience indicates the need of handling the demerit marks in such a way that they will not be exasperating pin-pricks. Formal notices following immediately after each offense should be avoided in favor of a monthly personal letter which will discuss both sides of the ledger. It should be explained that the usual practice with demerit systems is to keep the records confidential. When a man is called in so that his demerits are discussed with him he has opportunity to see his own record but not that of anyone else.

A plan which has been followed to utilize the principle of shame in discipline is to send to the school and instruction car platform the man who has abused the equipment or violated operating rules. The experience of mingling with greenhorns or of being heckled along the line by acquaintances while under the chaperonage of a platform instructor is not one that the delinquent will care to repeat if he can help it.

Some companies have found it a good plan to let the men themselves be the judges of certain infractions of discipline. Discipline committees might well be chosen from the experienced men as noted in Chapter XVI.

Brooklyn Merit Plan.—Each company using the merit system has introduced its own modification colored to a degree by the ideas of the management on the relative importance. The following is a general description of the practices of the Brooklyn Rapid Transit System:

This company introduced a merit system in 1903 with the expectation of preparing complete synopses of all reports. In practice, however, the volume of records was found to be so great that modifications were made later to provide for demerit records only.

This plan was designed to afford so complete a record of each trainman that a supervising official would not be compelled to act on anything but the facts. After some experience, however, the original plan developed several objections, one of which was that only an incomplete record was being furnished.

This led to a condition where different penalties were imposed on different divisions or even at the same terminal for violations of the same rule. Such variations on becoming known to the men led them to believe that favorites were protected.

To correct this condition analyses were then made of several thousand records with the result that the system now in force was adopted on Jan. 1, 1910.

The present system is based on the following fundamental principles:
Justice.

Equal treatment.

Reward for efficient service.

Discharge of incompetents.

Full publicity as to methods.

The incompleteness of record which had proved to be a handicap in earlier systems was overcome by the use of a code and a personal record card on which entries could be made by symbol. For example, 10a, as shown in the table of violations, means "car not under control." By proper classification the violations of major seriousness in an individual record appear to the left of a heavy vertical line on the personal record card, so that even a casual inspection will disclose the general character of a man's derelictions.

Different violations appear under fourteen headings with a further subdivision into two general classes as follows: First, those violations which occur under extenuating conditions and permit elasticity in discipline; second, those which do not occur under such circumstances and therefore demand a fixed penalty. Uniformity of treatment is maintained by careful supervision at the central office. The action of the terminal official is only recommendatory until it is finally indorsed as approved or as modified, at the central office. Such central supervision has promoted greater accuracy in both judgment and recommendation on the part of the supervisory officials.

In addition to interviews following individual reports, when a man's record shows 40 demerits he is called to the office of his division superintendent for a talk on his particular faults. Here the superintendent furnishes the trainman with a synopsis of his record to date and requires his signature on a certificate which states that the trainman appreciates the situation and will attempt to avoid mistakes in the future.

Each man reported for violations is notified on a form that the corresponding demerits have been imposed therefor. If he admits the correctness of the report, he signs his name on a line opposite the word "noted." But if he desires to protest the report, he signs his name below a sentence indicating his desire to speak to the division superintendent. In such cases the latter interviews the protestant and makes a special investigation. Where an accident is involved the division superintendent may rely upon the complete investigation of the claim department. If dissatisfied with the final findings of the division superintendent, the employee may appeal to the superintendent of surface lines.

Where fixed demerits are imposed, the discipline becomes operative when the correctness of the report is admitted by the employee or established by investigation; for infractions involving discharge or a variable number of demerits the final approval of the central office is necessary. For the latter cases the recommendations of the division superintendent are accompanied by a statement of the facts found by the investigation. This is held for information in the final review of the case.

A daily report is made from each terminal to the central office of all violations upon which final action has been taken. From these consolidated reports transfer is made of the findings to the individual personal record card, copies of which are held at the main office with duplicates at the employee's terminal.

This personal card, filed serially by badge number, contains in code form an entry for every violation and for the discipline administered. In addition, original papers, correspondence, reports of investigation, etc., are filed in the order of time in individual jackets for which cabinets are maintained.

Publicity as to discipline is obtained by arranging all violations in classes and printing them on a large card which is posted in the extra room. From an inspection of this an employee may know at any time the exact discipline fixed for any violation. By inquiring of the assistant superintendent he may find at any time the status of his record. In addition, when records are balanced semi-annually, notices are posted at each terminal showing the records of employees stationed there. In these notices the employees are identified by name and badge number.

Meritorious conduct has been made of tangible value by making it the basis of earlier increase in pay and of promotion. The rates of pay are on a sliding scale based on seniority, and the top rate normally is reached at the end of five years. However, a man who has a record of 20 demerits or less at the end of the first year receives a promotion to the pay for the third-year men. Similarly, at the beginning of the third year a good record entitles him to the fourth-year rate and so on, with the proviso, however, that after the first year an employee must have his record entirely free from demerits in order to receive these advantages.

Again, while a man is learning his duties during the first year, it is appreciated that he will have more unintentional violations than later. For this reason, an accumulation of 20 demerits is permitted at the end of the first year without detriment to the permanent record of the employee.

A man to whom an increase of pay for any particular year has been denied because of demerits can retrieve his standing by good work. This is possible through the plan of giving "service" credits at the rate of three per month. These credits are intended to offset minor irregularities on the theory that a certain leeway should be allowed and that men learn best through their mistakes, if given a chance to correct them. In addition to the regular monthly service credits, further credits are awarded to individuals for especially worthy deeds. These credits, of course, also may serve to offset demerits or may accumulate to counteract those subsequent violations that do not call for discharge.

The decision to allow 3 service credits each month was based upon the

analysis of past performances which showed that this number would be required to enable the average careful men to keep a satisfactory record.

Thus for two years' operation, ending Dec. 31, 1911, it was found that the average demerits per trainman was 2.93 per month. The average during the first year was 3.01, the second 2.84, indicating a gratifying improvement.

An accumulation of 80 demerits leads automatically to discharge. On Jan. 1, 1910, 54.7 per cent. of the men were on the demerit list with an average of a fraction over 21 demerits each. On Jan. 1, 1912, the number was only 34.1 per cent. with an average of 23 demerits each.

Promotions on efficiency records were allowed to men completing their first year of service in the fall of 1909, being extended to include all men on Jan. 1, 1910. By Jan. 1, 1912, nearly one-third of the men were drawing increased pay under this plan, not counting promotions. For the latter purpose eligibility lists of civil service type are maintained. The service record, general ability and temperamental fitness are the bases of eligibility. Where equal fitness appears in two men on the list preference is determined by seniority.

Pacific Electric Railway Merit System.—On the Pacific Electric Railway, which adopted the merit system in 1912, an accumulation of 75 demerits results in an automatic discharge. When 50 demerits have accrued, the employee is called to the office and told where he must improve if he wants to stay. No suspensions are recorded without notice to the person affected and without giving him the chance to explain. A man may see his own record at any time. A discharged employee may appeal personally to the superintendent, and if his re-employment is approved by proper authority the debit against his record will commence at 50 demerits. Merits are granted for good service. Monthly record bulletins are issued, showing for educational purposes the discipline meted out for specific violations and stating when necessary how the trouble could have been avoided, but giving no names or other identifying clues.

Sheboygan Merit Plan.—The Sheboygan Railway & Electric Company, Sheboygan, Wis., adopted a merit and demerit system on Jan. 1, 1911, on which date the employees were divided into four classes, A, B, C and D, as follows: Class A—those who have satisfactorily served the company for one year. Class B—those who have satisfactorily served the company for two years. Class C—those who have satisfactorily served the company for five years. Class D—those who have satisfactorily served the company for ten years.

For each additional year of good and efficient service members of each class were to receive stated sums of money as an extra reward, which is in no way connected with the wages. The cash bonus to each

eligible member of each class was set as follows: Class A—the sum of \$30. Class B—the sum of \$45. Class C—the sum of \$60. Class D—the sum of \$75. To be eligible for the bonus the trainmen had to have a net score of 100 on Jan. 1, the number with which he was credited on opening his “merit and demerit” account. In other words, merits and demerits had to balance so that a man would end the year with the same score he had at the beginning of the year.

The merits and demerits as prescribed under the system adopted by the company follow:

MERITS

1. Securing names and addresses of witnesses who saw accident, other than those on accident report, 2 to 10.
2. Assistance rendered in case of accident such as to bring commendation from passengers, 2 to 10.
3. Politeness and attention to passengers, calling special commendation from them, 2 to 10.
4. Complete and perfect accident reports, 2.
5. Careful handling of car, 5.
6. Clear record for one month, 10.
7. Turning in transportation or badges ordered up by the company, 5.
8. Special meritorious act calling for recognition by the company, 10 to 50.
9. Neatness in personal appearance, 5 to 20.
10. Informing the company of matters which are for the best interests of the service, 5 to 20.

DEMERITS

11. Disloyalty to the company, immediate discharge.
12. False statements, immediate discharge.
13. Intoxication or drinking while on duty or about to go on duty, immediate discharge.
14. Gross, ungentlemanly conduct, immediate discharge.
15. Disobeying positive orders or running by signals set at danger, immediate discharge.
16. General incompetency, immediate discharge.
17. Running by train meets, immediate discharge.
18. Failure to report accidents, 10 to discharge.
19. Incomplete and poor accident reports, 1 to 5.
20. Talking to others than proper officers of the company about accidents, 20.
21. Running railroad crossings without proper flagging, where required, 20.
22. Fast running over crossings, switches, around curves and along streets requiring slow speed, 5 to 20.
23. Not ringing gong when passing car, 5.
24. Passing standing car on streets without coming under complete control, 5 to 20.
25. Starting car without proper signal except to avoid accident, 5 to 10.
26. Not obeying conductor's signal, 5.
27. Failure of conductor to give proper signals, 2 to 10.
28. Following car in front too close, 2 to 10.

29. Leaving car without taking reverse lever or notifying conductor, 5 to 10.
30. Feeding current too fast, 5 to 10.
31. Careless and indifferent operation of car, 5 to 20.
32. Running ahead of schedule time, 5 to 10.
33. Allowing unauthorized persons to ride in front vestibule except as provided in bulletins, 5 to discharge.
34. Running away from passengers, 5 to 20.
35. Failure to report trouble with car or appliances, 5 to 10.
36. Giving bells too quickly before passengers are safely on or off, 5 to 30.
37. Inattention to passengers, 5 to 20.
38. Unnecessary conversation with passengers, 5.
39. Unnecessary conversation with motorman, 5 to 20.
40. Riding in front vestibule with motorman unless absolutely necessary in special cases, 5 to 20.
41. Dirty cars, 5.
42. Untidy condition of dress, 5.
43. Reading while on duty, except such as pertains directly to your duties, 10.
44. Sitting down while on duty, except as provided for in bulletins, 2 to 20.
45. Not looking to the rear when starting when conductor is ahead, 2 to 10.
46. Jerking car when starting or stopping, 2 to 10.
47. Laying over at the end of the line after leaving time, 2 to 20.
48. Missing fares, each fare 5.
49. Failure to register fares, each fare 10.
50. Bunching fares, 5.
51. Making change before registering fare, 5.
52. Carrying persons free, 20.
53. Starting car from front when aisle is clear, 10.
54. Backing any double-end car in the city without first turning trolley and reversing position of trainmen—except to avoid collision or accident, 2 to 10.
55. Failure to properly reset registers at proper time and place, 5.
56. Errors or omissions on report trip sheets or envelopes, 1 to 5.
57. Not having markers or other necessary signals lighted at sunset, 5.
58. Impolite remarks to passengers (on all reports received from passengers complaining of the actions or conduct of trainmen there will be a charge against the trainman under this head, even though the charge is not sustained by investigation), 5 to discharge.
59. Failure to warn passengers to wait for car to stop when alighting, 5.
60. Failure to regulate the heating and ventilation of cars in accordance with the bulletins, 2 to 10.
61. Carrying passengers by their destination when previously notified of same, 1 to 10.
62. Failure to cancel all tickets at the time of receiving same, 1 to 10.
63. All acts of omission detrimental to good service in the opinion of the superintendent, 5 to discharge.

Illinois Traction Merit Plan.—On May 15, 1911, the Illinois Traction systems put into effect on the interurban lines a system of discipline based on merits and demerits. The practice of suspension for violation of rules was discontinued and a certain number of marks entered against a man's record, the object being to avoid the loss of wages by persons employed. Since demerits are given for unsatisfactory service, merits are also given

for good service, and these are applied to cancel demerits. All applications for merits must be filed within five days after the occurrence. The supervisory board meets bi-monthly to investigate the produced evidence and pass judgment on all violations of the rules and on meritorious conduct. The minutes of the board are kept as part of the records of the merit system. Whenever such marks are given a notice is posted stating how many marks have been given and on what charge, omitting names, train and car number. When the demerits of a man have reached 90 he is cautioned by the superintendent and advised that when they reach 100 he will be dismissed from the service. Employees are permitted to examine their records at any time upon application, but no employee is permitted to see the record of any other employee. The merits and demerits cover fifty-three items.

Chicago Elevated Merit Plan.—In 1911 the Metropolitan West Side Elevated Railway started a new system of merits and demerits. Instead of using spotters, the inspectors were taken from the ranks of the most experienced men in the service and did their work openly. The inspectors were instructed to ride for parts or all of the runs, and had the authority either to warn the men or to compliment the men on their work. As the result of experience with cumbersome records, the company adopted for general office record a sheet containing space only for the man's name, file number and the day of the month on which he was inspected. The date figures are written in green, violet, black or red ink according to whether the inspector reported "correct," "fair," "poor" or "men warned." The detailed description of any particular offense, instead of being transferred to a general record, was kept in the envelope relating to each trainman.

Fine System of Discipline.—One more system of discipline remains to be considered, that of assessing fines for offenses. This is common enough in Germany, where fines are levied against the trainman's indemnity even for damage to equipment. In this country, however, a fine system appears to be used only by the Muskogee (Okla.) Electric Traction Company. It was placed in effect on that road on Jan. 1, 1912, and after five years' use with it the company reported that it has proved highly efficacious. Under this fine system, the trainman violating the rules is forced to work for less pay per hour.

Before instituting fines the management considered discipline from the quality-of-service standpoint. It was its desire to pay the good trainman more wages than the poor one. According to the usual scale of wages, after a trainman has been in the service five years he receives the maximum wage, and his weekly or monthly income is not affected unless he is suspended. Under the fine system, trainmen guilty of petty

violations which would not be subject to a suspension under the old system are assessed a small amount.

Prior to the time that this system was adopted, the scale of wages ranged from 15 cts. to 22 cts. per hour. This rate was increased to 19 cts. per hour minimum and 25 cts. per hour maximum at the end of five years' service. Since its inception it has been observed that poor men automatically discharge themselves when the total fines assessed equal the wages received. The total amount of money collected annually for fines was very small for the first year, and the effect of the discipline was quite marked in that but few men were fined, and new rules as well as the old were carefully observed. In October, 1915, the penalties were incorporated in a contract signed with the employees' union. The deductions are made from the scale for the full month in which the violation occurs. Each violation is considered a separate offense except as to No. 9.

The list of fines follows:

GENERAL

1. 5 cents per hour for drinking or being intoxicated on duty.
2. 5 cents per hour for failing to report accident on trip such accident occurs and securing all available witnesses.
3. 5 cents per hour for gambling on the company's premises.
4. 5 cents per hour for failing to flag a railway crossing.
5. 5 cents per hour for smoking cigarettes on duty.
6. 5 cents per hour for a collision with vehicles or animals which could be avoided.
7. 5 cents per hour for impoliteness.
8. 2 cents per hour for backing car more than one car length without changing trolley.
9. 2 cents per hour for failing to wear a full uniform after thirty days.
10. 1 cent per hour for failing to report for duty on time.
11. 1 cent per hour for not displaying proper destination sign.

CONDUCTORS

12. 3 cents per hour for failing to enforce the "Jim Crow" law and properly displaying marker.
13. 2 cents per hour for failing to give proper signals.
14. 5 cents each for accepting old transfers in payment of fare.
15. 1 cent per hour for failing properly to punch transfers.

MOTORMEN

16. 2 cents per hour for failing to ring gong on approaching street intersection.
17. 5 cents per hour for sitting down while car is in motion.
18. 2 cents per hour for starting car on one bell.
19. 2 cents per hour for passing passengers who wish to board car.
20. 2 cents per hour for talking to trainmen when car is in motion.
21. 2 cents per hour for arriving at end of run more than one minute ahead of time.

Some Causes of Friction.—The following points are mentioned because of their bearing on relations with the men and discipline.

Re-examinations.—Nothing is feared more by the older trainman than re-examinations for impaired sight and hearing, and in some places where the men are organized they have even demanded that such examinations be abolished. This question is of comparatively little importance on city lines, but it is a vital one on high-speed lines where safe operation depends absolutely on the correct color perception, sharp hearing and sound heart of the trainmen. As the railway and not the employee foots the accident bill, the former cannot afford to give up the right to re-examination. Such tests must be made annually on the men to check the possible defects due to their advancing years and also whenever important changes are made in signal apparatus and other operating features.

It is hard to believe that the men do not appreciate the duty of the railway to make these examinations. Much of their opposition really arises from a fear that they are used to discharge the higher-priced men. This fear can be allayed by the company only by making it known that an effort will be made to retain the depreciated man in the service at less responsible work and at as high a rate as can consistently be paid to him. This policy would show the fairest possible spirit, and if the company selects its men carefully in the beginning the proportion of annual rejections will be too small to affect the pay-roll.

As in other matters which affect an employee's well-being, there should also be a chance to appeal against the physician's rulings. A case comes to mind where an elevated railway motorman was rejected at the periodical examination for supposed heart weakness. He then visited a heart specialist and was pronounced absolutely sound, yet under the rules of the company no mode of appeal was open whereby he could have secured redress. It should always be remembered that injustice of this kind not only affects the discharged man but embitters all his comrades against the management.

Suspension for Accidents.—Should a man be suspended pending an investigation of an accident by the claim department in addition to being charged with demerits if found at fault? Suspensions should be very carefully considered, because if the ex-employee is called as a witness the fact that he was discharged by the company can be used by the complainant as presumptive evidence of the company's guilt. In any event, if a man is proved innocent the company should re-imburse him for what he might have earned during the time lost.

Fining for Shorts.—On some roads the conductors are fined in cash for the amount of transfers short. To the conductors this appears unjust because they know that the company got the original cash so that the shortage of transfers should be charged up simply as a demerit.

Paying Night Men in the Daytime.—Men who are working night cars should not be required to come to the depot on pay day, thus breaking their rest. Why not turn over their pay envelopes to the day depot master who in turn could give it to the night depot master? It is not necessary to have a night paymaster except on very large systems.

Pay Safety Committees for Their Time.—The employees' safety committee is a good horse but should not be driven to death. A company can well afford to show respect for the work of the men by paying them for their time, and have the meetings at hours when their minds will be fresh and willing.

Responsibility for Accident Reports.—There should be a distinct understanding as to who is responsible for reporting accidents. On some systems accidents are reported directly to inspectors, but the latter may fail to inform the carhouse involved. In such cases the men are reprimanded for having failed to advise the right inspector. This indicates the desirability of teaching the new man how to recognize the various subordinate officers.

Discharge for Accidents.—Caution should be exercised in making so broad, or rather so narrow, a rule that men will be discharged for certain classes of accidents without a hearing. Sometimes, as in winter, collisions due to slippery rails or excessive use by vehicles of clean tracks on snow-covered streets cause many accidents that cannot possibly be avoided. In such cases due allowance ought to be made for a man's previous record.

Supplies.—It may be proper to punish a man for losing supplies, but the amount charged against him should not be more than the cost price of the article.

Allowance for Outside Time.—A company can well consider the advisability of making some allowance for time spent by the men in company association activities, such as the players on the ball team, members of the company orchestra, etc. While this is not directly concerned with transportation, if it is a recognized part of the company's welfare program, the company has a responsibility in connection with it. Some of the men who engage in these activities for the pleasure of their associates may not be able to give their time gratis.

Promotion.—Fraternal society relations should not be allowed to guide officials in the promotion of employees.

Complaints against Employees.—It is a common experience of the transportation manager that many of the complaints brought against platform men are so trivial that they merit little or no discipline. Nevertheless, it is the part of wisdom to lend a respectful ear to the complainant and to appease him if possible. Nine times out of ten he will leave the office happy and assured that his case will be investigated immediately and that proper discipline will be meted out. The manager, however,

should not give his visitor the slightest inkling as to the nature of the punishment, because the chronic kicker is just the kind of person who would use that knowledge to humiliate the same platform man in the future. A change of run which works no harm to the employee is often the most effective means of giving such unjust complainants the flattering idea that their word is mighty in the councils of the company.

Plain-clothes Inspectors.—In view of the weaknesses of human nature the need exists on some systems, particularly in large cities, of non-uniformed inspectors. There are many things which such inspectors can find for they wear no uniform to betray their coming or arrival. The danger with spotters who are drawn from outside sources is such an overwhelming desire to make good that they may do a great deal of harm to innocent men. Several companies have therefore devised the compromise of plain-clothes inspection by employees who not only have platform rules and duties at their finger tips, but who have been found perfectly trustworthy. These men can be relied upon to report something more about the men than register readings—their behavior toward passengers; their manner of collecting fares and issuing transfers; their skipping of stop signals; their irregularity at time-points; their over-speeding or loafing; their handling of controller, brake and register apparatus, etc.

The chief reliance of most companies, however, for inspection must always be the professional secret service men, and if care is taken to select responsible men for this duty and if their work is checked up at frequent intervals, there is little danger of error. Of course, when a spotter becomes known his usefulness has gone. Hence most men who undertake this work, except on the very largest properties, travel from one road to another.

Register Checking.—A few words are not out of place on the matter of register checking, the bane of every operator. Mistakes under the stress of many duties are so easy to make that small discrepancies should not necessarily brand a man with suspicion. Only the large peculation, or the one so often repeated that it is known to be intentional, calls for immediate summary action.

One of the valuable services of the prepayment system is that it has greatly increased confidence in the general honesty of conductors. In fact it has shown that more fares have been missed through the conductor's failure to collect and the passenger's torpidity to offer payment than from wilful stealing. Furthermore, dishonesty has been made harder and inspection easier since all fare transactions are at one place.

Fundamentally, there is no more reason why a conductor should be false to his trust than other men who handle money. All but the inborn crook start with the idea of doing exactly the right thing. However, before a man has been collecting fares very long he is likely to find that he

has more money than is shown by his register; contrariwise, he may have less money than is shown by his register. These discrepancies reveal to a man how easy it is to knock down a fare now and then without detection. Thus a natural desire to balance the "overs" and "shorts" may tempt a man to go the wrong road. A watchful receiver, however, can readily detect an unusual drop in the earnings of a particular run. If an investigation discloses no bad weather or other conditions which affect traffic, it is time to put a "spotter" on the car. Gross stealings are therefore readily detected by an analysis of trip-sheet returns.

One old-school superintendent used to say that he would never discharge an experienced man who was reputed to take half a dozen fares a day, because a man who had a good record for handling passengers and avoiding accidents was worth keeping against the expense of hiring a new man who might have the old man's bad quality in addition to the recruit's natural tendency to get into other troubles. Who will deny that this superintendent's stand was not practical even though unmoral? That he did have to wink at petty larceny, however, is a proof that something was wrong with the management in not being able to keep a force of men who would be both experienced and honest.

CHAPTER XIX

FORMS OF EXTRA PAY

The idea that wages should be based on seniority alone is losing caste. No industry has the right to expect intelligent men to stay in its ranks if it cannot offer some premiums for the exceptional skill and conduct of the men who, at best, may have to wait years for promotion to a higher position. Length of service alone may entitle the older man to pick out the passenger run which gives him the easiest hours or the freight run which involves less wear and tear on his nerves, but skill alone should be the operator's guide in picking men for teaching; for fighting snow with apparatus demanding mechanical ability in emergencies; for paying premiums for minimum energy consumption and for freedom from accidents. Thus various forms of extra pay for the best men are available on many properties.

Platform Instruction.—One of the most common forms of extra pay is for acting as a platform instructor. The men in this service are paid say 2 cts. an hour extra as on the Utica & Mohawk Valley Railway of Central New York, or 4 cts. an hour as at Hampton, Va. Sometimes the day basis is used as is indicated by figures like the following: Boston Elevated Railway, 10 cts. (in 1911); Houston (Tex.) Electric Company, 15 cts.; Public Service Railway, and Joplin & Pittsburg Railway, 25 cts. The Houston company encourages the platform teacher still further by giving him a bonus of \$5 for each student who makes a satisfactory record for his first six months.

Snow Fighting.—Snow fighting is frequently demanded as a seniority privilege, but it is preferable to call for vigorous volunteers and pick those who have some mechanical ability.

On the Boston Elevated Railway and Bay State Street Railway application for snow work must be made before Oct. 15, seniority being practised in the awards as far as possible. On these lines such work without meal relief is also limited to 6 consecutive hours—a condition which might be very hard to fulfill on long interurbans. On the other hand, the requirement that men who have been in snow service be excused for the rest of the day is unreasonable in small cities.

Not all companies pay a fixed premium for snow service, and a few do not even make arrangements for hot meals en route. The condition set by the Indiana Public Service Commission in the Indianapolis arbitration was that while the company need not grant extra pay per hour for

snow-plow and sweeper crews, it should pay for full time if a man completed this work within less time than his regular run. The company was also ordered to furnish meals. Some typical extra rates and special conditions follow:

Des Moines (Ia.) City Railway, 5 cts. an hour extra and meals; Rhode Island Company, 10 cts. an hour extra; Bay State Street Railway, 3 cts. extra with a special rate of 45 cts. for the foreman in charge of the minimum gang of three men per plow; Empire United Railways and United Traction Company, no less than regular run of day would amount to or time and a half on an hour basis; Public Service Railway, uniform rate of 35 cts. an hour for motormen and 30 cts. an hour for other men on sweepers, plows and levelers, equivalent to one and one-quarter to one and one-half times the regular rate, depending on seniority.

In 1915 a Chicago arbitration board fixed snow service on the Chicago Surface Lines at 36 cts., the same rate as the maximum wage; or that paid to the five-year men, and 9 cts. more than the minimum wage. The Buffalo, Lockport & Rochester Railway pays to snow crews 32.5 cts. an hour, 2.5 cts. more than the regular maximum.

In this connection it may be worth suggesting that the addresses of all men selected for this service should be on display boards in the carhouse so that the men can be reached without calling at their old addresses first. Of course few platform men have telephones in their homes, but it will prove convenient to know the telephone number of the nearest store.

Passes.—Employees of grocers do not expect free food nor do furniture clerks expect a free supply of beds and rocking chairs. The railway man, however, expects free riding as a matter of course and as something not to be reckoned in lieu of pay. Supervisory officials, of course, should ride without restriction of any kind as this is in the nature of their duties, but the riding of platform men during off-duty hours should be within reason.

In December, 1914, according to a canvass made of ninety-two English lines, fully eighty did not grant passes for off-duty travel.

The Georgia Railway and Electric Company withdrew on Jan. 1, 1915, all passes and tickets, but refunds fares paid in company travel.

Many companies, however, permit riding on a badge or on a card bearing the person's name. Such a card preferably is framed in leather and fitted with a celluloid cover to keep it in good shape. As pass riding is liable to confuse register readings, one company furnished its men with miniature visiting cards bearing the employee's name. These were accepted as tickets and duly registered. The New York Railways and Interborough Rapid Transit Company, New York, extend the pass privilege to the wife or other marketing member of each employee's family, as mentioned in the chapter on welfare work.

The Sacramento (Cal.) Electric, Gas & Railway Company discontinued all passes in 1911, but employees are allowed four rides a day.

In September, 1912, the Pacific Electric Railway announced that all men who had been in the company's service more than seven years could ride free over any divisions of the line; and further, that in the case of men in the service more than twelve years, not only they but all dependent members of their families would enjoy the same privilege. Baltimore pensioners have passes. Such privileges are most substantial gifts, especially as a man is thus enabled to live in the low-rent zone of the suburbs.

The British Columbia Electric Railway provides free rides for employees at all times and for their families occasionally. As it operates lighting systems, it gives half rates for current and free installation of meters. When in 1915 a board of arbitration discussed wage conditions on this property, it stated that it would not attempt to capitalize the value of these concessions in dollars and cents. However, it would have to consider them some way in an inquiry into the cost of living. The permanency of work offered by the company it held to be of greater importance.

The Brooklyn Rapid Transit Company since Jan. 1, 1916, has extended free transportation (on presentation of a special badge) to all employees of the mechanical, electrical and way and structure departments who are paid by the week.

Rewards for Avoiding Accidents.—A recent but most promising form of extra pay is that for accident reduction, following therein the practices of London and Paris bus companies. The Newport News & Hampden Electric Railway and Virginia Railway & Power Company furnish uniforms free twice a year, practically \$35 to \$45, to men who have had no accidents in excess of \$10 during the preceding six months. Since 1911 the Memphis Street Railway gives semi-annually a bonus of 1 ct. an hour for each hour's service to all platform men who have not had during the preceding six months an accident for which they were personally responsible. A similar plan is used by the Louisville (Ky.) Street Railway and the United Railroads of San Francisco.

In 1912 the Jackson (Miss.) Railway & Light Company, Jackson, Miss., announced that motormen who went through a month without accidents would receive a bonus of \$5. If they had an accident they would be fined \$5, unless witnesses testified that the motorman was not to blame. Further, the crews that keep their car cleanest inside and out and present the neatest personal appearance receive \$5 each man. The amount of \$5 is also given to the most courteous, most accommodating and most businesslike conductor. It is understood that the award is invalidated if the man has had a layoff during the period.

For a number of years the Fishkill (N. Y.) Electric Railway has followed the practice of giving \$3 a month bonus to every platform man who shows a clean slate as regards obedience to the rules.

At Christmas, 1915, the Washington (D. C.) Railway & Electric Company distributed \$15,527 from profits to 790 transportation men. This profit-sharing plan was founded on the company's experience of the year 1911 when 26 per cent. of the car earnings (less 4 per cent. District of Columbia tax) was paid out for platform wages, accidents and damages. The company then agreed that should the 26 per cent. amount to more than the same items for 1912, the surplus should constitute a profit-sharing fund and be distributed in cash at the end of the year. Under this plan each man in meritorious service for one year or more received a check for \$23.17, those in service eleven months received \$20.15, and amounts proportionate to time were paid to all others. This plan was abandoned, however, after the strike of 1916.

The accident-saving idea applied on the Little Rock (Ark.) Railway & Electric Company resulted in reducing accident costs in 1914 by \$7500 over the preceding year. This amount was turned back to the men in the form of 1 ct. per hour more during 1915. We believe, however, that a plan which turns over a lump sum once a year would be better as this is a greater incentive to save, whereas the raise per hour is absorbed in higher living expenses.

The San Diego Electric Railway sent on Feb. 20, 1915, a check to each trainman representing his share of nine months' reduction in accident cost, based on improvement over the three years preceding. The total amount of \$15,468.69 was divided among the men according to their car-hours.

A temporary participation plan was used for the month of August, 1915, by the Kansas City, Clay County & St. Joseph Railway, a high-speed interurban railway. The sum of \$100 was divided among all accident-free men, resulting in extra pay of \$1.24 to \$2.53 according to car-hours employed. Despite extra heavy travel, only four minor accidents occurred. The experiment showed clearly what the men could do through alertness, and suggests the desirability of establishing some premium for exemption from accidents, using a low record established during some month as a bogey.

In the plan followed by another important company a certain per cent. of the gross revenue is set aside each year to pay injury and damage expenses arising from the operation of the cars, and 40 per cent. of any saving made from the allowance is distributed in the form of a bonus to the employees in the transportation department, a similar percentage goes to the company, and the remaining 20 per cent. into a fund for keeping the records. The motormen and other employees who are entitled to

receive a bonus draw 73 per cent. of the employees' share, and the conductors entitled to a bonus draw the remaining 27 per cent. The bonuses received by the motormen and conductors under this plan climbed steadily during the first year of the operation of the system until the motormen were earning \$7 extra each month and the conductors about \$5 each month. The other employees in the transportation department, such as division superintendents, supervisors, foremen, clerks and miscellaneous car service men, received approximately the same amount of extra money.

In addition to the money allowed to meet injury and damage payments, another sum is set aside for the maintenance of equipment. If by careful operation there are fewer collisions and less property is destroyed, the difference between the allowance and the cost of repairs and replacements is divided. Moreover, the saving in power through the intelligent operation of the cars figures in the bonus appropriation. A certain sum is also established as the reasonable earnings per car-mile, and if every car hauls its own load, keeps on its own space or secures increased fares, the difference earned above the sum designated is divided among the employees. The right of employees to share in the bonus distribution is determined from their records as shown in the merit book.

Saving Energy and Supplies.—Other forms of extra pay based on a basis of ability alone are awards for saving electrical energy and coal. The coasting recorder, which shows the time a man runs without energy, and the ampere-hour and watt-hour meters, which show the quantity of energy used, are both employed in this country. Some companies use these devices simply to improve the motormen, but others give the men a share in the savings effected. One of the first companies to announce a plan of this kind was the Bradford (Eng.) Corporation Tramways. Its car meters had shown that some men were spending 2 to 4 cts. an hour more for the same runs than were others. At the same time, the corporation concluded to reward conductors whose courtesy and care promoted travel.

The Topeka (Kan.) Street Railway effected a saving in car stove coal by prize contests as follows: The best motorman got a \$6 prize for one month's record, and others received \$3, \$2 and \$1. Under this plan each motorman received tickets which entitled him to a certain amount of coal, one ticket being turned into the accounting department for coal received. As the company uses Pennsylvania nut coal at \$12 a ton, the work of the men was a real factor in economy.

Prizes for Useful Ideas.—It is now quite common to give prizes for useful safety and operating ideas. Thus in February, 1914, the Aurora, Elgin & Chicago Railroad offered waste-saving prizes as follows: First prize, \$50; second, \$25; third, \$20; fourth, \$15; fifth, \$10; and six \$5 prizes. The men had one month for competition. The prizes were

awarded by a committee of three privates, one department head and one senior officer.

Profit Sharing and Sale of Stock.—In addition to the forms of extra pay to employees mentioned above, based on additional work performed by individuals or upon the exercise of especial efficiency or economy in operation by the force as a whole, direct methods of profit sharing have been tried. Some of these were described in the report of the 1912 welfare committee of the American Electric Railway Association which says:

"The earliest was put into effect in Denver in 1898 when the company divided with the men any excess over certain daily receipts. The next year at Columbus the same rate of dividend was paid upon wages as was paid upon the company's stock. Two years later at Detroit the company purchased its own stock in the open market and allowed its employees to buy it at the same figure, paying for it in installments of \$5 a month. In 1902, in British Columbia, one-third of all surplus remaining after a 4 per cent. was paid to stockholders was divided among the employees. In 1909, at Spokane, Wash., stock was sold to employees on easy terms, while the company at Decatur, Ind., had for some time hired no trainmen who would not purchase one share of stock and subscribe for five more." Other examples of easy-payment stock selling offers to the men by different electric railway companies are the following:

The American Cities Company, New Orleans and Memphis, has sold preferred stock in the latter city at \$63.50 a share. In February, 1911, the Portland (Ore.) Railway, Light & Power Company sold stock at \$75 a share. In 1913 the Scioto Valley Traction Company set aside for sale 1000 shares at \$12.50 each, limited from five to twenty shares per man and payable in one year in monthly installments with offer to repurchase at sales price within two years. In the same year the Public Service Railway sold 1 to 100 shares per man at \$115 per share on the basis of an initial payment of \$5, \$1.50 a month, 6 per cent. dividends on par value of stock and deduction of 5 per cent. interest on the unpaid remainder.

Still other plans of profit sharing and the sale of stock on easy terms to employees followed by industrial and other companies, including a few public utility companies, are described in a special report issued in 1916 by the director of the welfare department of the National Civic Federation. Besides stating that some of the plans just mentioned have been abandoned the Federation report says that in some plans of stock sales to employees the latter receive, in addition to their regular dividends, a bonus yearly for not disposing of the stock or leaving the employ of the company. It also speaks of points of divergence of interest when the principal stockholders want to establish a large surplus to

extend the plant or for some other purpose and the employee-stockholder wants all profits divided. It also declares that trades unions generally are opposed to such profit-sharing plans on the ground that when they are in force the market wages are not paid for labor, and the men prefer a fixed wage scale upon which they can count.

Nevertheless, it seems obvious that in an industry where the financial returns depend so much upon the efficiency of the individual employee as in the electric railway business, some system of interesting him in his daily work can be used to advantage. Probably but few employees among the trainmen would have enough capital to engage in the purchase of stock. For those who desire to do so some system of easy payment for stock can well be established. But there should be opportunity for wider application of some method of paying bonuses for individual work or group work well done, similar in principle to the piece-work systems in use by many manufacturing plants. The application of this plan to transportation service may seem difficult but it should not be impossible and it would act as a direct incentive to faithful service.

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